SPECIFICATIONS FOR

BREWSTER CENTRAL SCHOOL DISTRICT
CAFETORIUM ADDITION, INTERIOR RENOVATIONS & RELATED WORK AT C.V. STARR INTERMEDIATE SCHOOL

SED PROJECT NO.: 48 06 01 06 0 001 026
F&D PROJECT NO.: 23505.02

OWNER: **BREWSTER CENTRAL SCHOOL DISTRICT**
30 Farm Market Road
Brewster, NY 10509

PROJECT NAME: **Cafetorium Addition, Interior Renovations & Related Work**

FULLER D'ANGELO P.C.
ARCHITECTS PLANNERS

ARCHITECTS:

FULLER AND D'ANGELO, P.C.
Architects and Planners
45 Knollwood Road Suite 401
Elmsford, NY 10523

SITE:

INSITE ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C
3 Garrett Place
Carmel, New York 10512

STRUCTURAL ENGINEER
GROSSFIELD MACRI , P.C.
34 Shadow Hill Road
Ridgefield, CT. 06877

MECHANICAL:

LANDMARK FACILITIES GROUP, INC.
252 East Avenue
Norwalk, CT 06855

ENVIRONMENTAL:

ENVIROSCIENCE CONSULTANTS
37 Moore Avenue
Mt. Kisco, NY 10549

FOOD SERVICE:

RAYMOND AND RAYMOND
4 St. John Street
Goshen, NY 01924

AUDIO /VISUAL
GRZEBIK DESIGN GROUP
50 Amber way
Petaluma, CA 94952

The undersigned certifies that to the best of his knowledge, information and belief, the plans and specifications are in accordance with applicable requirements of the New York State Uniform Fire Prevention and Building Code, The State Energy Conservation and Construction Code Standards of the Department of Education.

DATE: 12/9/2024 **BID**

TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 08 - OPENINGS

08 1113	HOLLOW METAL DOORS AND FRAMES
08 1613	FIBERGLASS DOORS AND ALUMINUM FRAMES
08 3100	ACCESS DOORS AND PANELS
08 4413	GLAZED ALUMINUM CURTAIN WALLS
08 5113	ALUMINUM WINDOWS
08 5123	STEEL FIRE RATED WINDOWS
08 6200	UNIT SKYLIGHTS
08 7101	DOOR HARDWARE SCHEDULE
08 8000	GLAZING
08 8004	METAL WINDOW PANELS
08 9100	LOUVERS

DIVISION 09 - FINISHES

09 2116	GYPSUM BOARD ASSEMBLIES
09 2662	GYPSUM SHEATHING
09 3000	TILING
09 5100	ACOUSTICAL CEILINGS
09 6500	RESILIENT FLOORING
09 6623	RESINOUS MATRIX TERRAZZO TILE
09 6725	EPOXY RESIN FLOORING
09 7700	PLASTIC LAMINATE WALL SURFACES
09 9123	INTERIOR PAINTING
09 9300	STAINING AND TRANSPARENT FINISHING - BONA

DIVISION 10 - SPECIALTIES

10 1100	VISUAL DISPLAY UNITS
10 1400	SIGNAGE
10 2113	PLASTIC TOILET COMPARTMENTS
10 2213	WIRE MESH PARTITIONS
10 2239	FOLDING PANEL PARTITIONS
10 2601	WALL AND CORNER GUARDS
10 2800	TOILET, BATH, AND LAUNDRY ACCESSORIES
10 4400	FIRE PROTECTION SPECIALTIES
10 5100	LOCKERS
10 7316.13	METAL CANOPIES

DIVISION 11 - EQUIPMENT

11 4000	FOOD SERVICE EQUIPMENT
11 5213	PROJECTION SCREENS AND MOUNTS
11 6143	STAGE CURTAINS

DIVISION 12 - FURNISHINGS

12 2113	HORIZONTAL LOUVER BLINDS
12 2940	ROLLER SHADES
12 3200	PLASTIC LAMINATED CASEWORK
12 3600	SOLID SURFACING WINDOW SILLS AND COUNTERTOPS
12 4813	ENTRANCE FLOOR MATS AND FRAMES

DIVISION 14 - CONVEYING EQUIPMENT

14 2100	ELECTRIC TRACTION ELEVATOR
14 4200	WHEELCHAIR LIFTS

DIVISION 22 - PLUMBING

22 1116	DOMESTIC WATER PIPING
22 1316	SANITARY WASTE AND VENT PIPING
22 1319	SANITARY WASTE PIPING SPECIALTIES
22 1413	BUILDING STORM DRAINAGE PIPING
22 1423	STORM DRAINAGE PIPING SPECIALTIES

DIVISION 23 – MECHANICAL

23 0485	COMMISSIONING OF HVAC SYSTEMS
23 0500	BASIC MECHANICAL MATERIALS AND METHODS
23 0517	SLEEVES AND SLEEVE SEALS FOR HVAC PIPING
23 0519	METERS AND GAGES FOR HVAC PIPING
23 0523	GENERAL-DUTY VALVES FOR HVAC PIPING
23 0529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
23 0548	VIBRATION CONTROLS FOR HVAC PIPING EQUIPMENT
23 0553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
23 0593	TESTING, ADJUSTING AND BALANCING FOR HVAC
23 0715	HVAC DUCT INSULATION
23 0719	HVAC PIPING INSULATION
23 0993	SEQUENCE OF OPERATIONS FOR HVAC EQUIPMENT
23 2113	HYDRONIC PIPING
23 2116	HYDRONIC PIPING SPECIALTIES
23 2300	REFRIGERANT PIPING
23 3113	METAL DUCTS
23 3300	DUCT ACCESSORIES
23 3423	HVAC POWER VENTILATORS
23 3433	COMMERCIAL AIR CURTAINS
23 3533	KITCHEN VENTILATION SYSTEM EXHAUST DUCTS
23 3600	AIR TERMINAL UNITS
23 3713	DIFFUSERS, REGISTERS AND GRILLES
23 7200	AIR-TO-AIR ENERGY RECOVERY EQUIPMENT
23 7416	PACKAGED ROOFTOP AIR-CONDITIONING UNITS
23 8129	VARIABLE REFIGERANT FLOW HVAC SYSTEMS

DIVISION 26 - ELECTRICAL

26 0519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 0533	RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
26 0543	UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS
26 0544	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
26 0553	IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 2413	SWITCHBOARDS
26 2416	PANELBOARDS
26 2726	WIRING DEVICES
26 2813	FUSES

SECTION 00 0115
LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DRAWING INDEX

A. Drawings are listed on Drawing T-1 for all contracts.

B. Drawings are the property of the Fuller and D'Angelo, Architects and Planners, and shall not be used for any other purpose other than contemplated by the Drawings and Project Manual

PART 2 - PRODUCTS (NOR USED)

PART 3 - EXECUTION (NOT USED)

SECTION 00 2113
INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DOCUMENT INCLUDES

A. Bid Documents and Contract Documents
   1. Definition
   2. Contract Documents Identification
   3. Availability
   4. Examination
   5. Inquiries/Addenda
   6. Product/Assembly/System Substitutions

B. Site Assessment
   1. Prebid Conference

C. Qualifications
   1. Qualifications

D. Bid Submission
   1. Bid Depository
   2. Bid Ineligibility

E. Bid Enclosures/Requirements
   1. Security Deposit
   2. Consent of Surety
   3. Performance Assurance
   4. Bid Form Requirements
   5. Bid Form Signature
   6. Additional Bid Information

F. Offer Acceptance/Rejection
   1. Duration of Offer
   2. Acceptance of Offer

1.3 RELATED DOCUMENTS

A. Section 01 1000 - Summary of Contracts

B. Section 00 4100 - Bid Form Construction Contractor .

C. Section 00 4110 - Bid Form - Plumbing Contractor

D. Section 00 4120 - Bid Form - Contract #3 HVAC

E. Section 00 4130 - Bid Form - Electrical Contractor

F. Section 00 4401 - Qualification of Bidders.

G. Section 00 4402 - Hold Harmless Agreement

H. Section 00 4460 - Certification of Compliance With the Iran Disinvestment Act **OR**:

I. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act.

J. Section 00 4476 - Insurance Certification.

K. Section 00 5200 - Agreement Form.

L. Section 00 6000 - Bonds and Certificates.

M. Section 00 7200 - General Conditions.

N. Section 01 2100 - Allowances.

O. Section 01 2300 - Alternates .

P. Section 01 5000 - Temporary Facilities and Controls.

Q. Section 01 7000 - Execution.

R. Section 01 7800 - Closeout Submittals

1.4 BID SUBMISSION

A. Bids signed and under seal, executed, and dated will be received at the office of the Brewster Central School District, 30 Farm To Market Road, Brewster, New York 10509 before 2:00 PM local time on the 16 th day of January, 2025

B. Offers submitted after the above time will be returned to the bidder unopened.

C. Offers will be opened publicly immediately after the time for receipt of bids.

1.5 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete CV Starr Cafetorium Addition, Interior Renovation & Related Work located at the CV Starr Intermediate School for a Stipulated Sum, in accordance with the Contract Documents.

1.6 LUMP SUM BIDS

A. Bids will be received for four (4) separate Prime Contracts as follows:
   1. General Construction .
   2. Plumbing .
   3. HVAC .
   4. Electrical .

1.7 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises building construction, including Related General Construction, Plumbing, HVAC, and Electrical Work.

B. Project Location:
   20 Farm To Market Road.
   Brewster, New York 10509.

1.8 CONTRACT TIME

A. Perform the Work within the time stated in Section 01 1010 Milestone Schedule.

B. All work for this project shall not commence prior to the issuance of Letter of Award by the Owner. The items of work shall be scheduled and completed as stated in Section 01 1010 Milestone Schedule. Failure to complete either date listed in Section 01 1010 Milestone Schedule, shall subject the Contractor(s) to be assessed liquidated damages list in Article 8 of the General Conditions and any additional costs incurred by the Owner, including but not limited to, Construction Manager, Fuller and D'Angelo, P.C., Consultants, Owner's staff, overtime, and legal costs as required to complete the scheduled item.

C. The attention of the bidders is specifically directed to the provisions of the General Conditions of the Contract Article 8 of the General Conditions that time is of the essence to the Contract and that on no account will the Contactor(s) be permitted to assert a claim for damages for delays.

D. The bidder, in submitting an offer, accepts the Contract Time period stated for performing the Work. The completion date stated in the Agreement and Section 01 1010 Milestone Schedule. .

1.9 BID DOCUMENTS AND CONTRACT DOCUMENTS

A. Definitions: All definitions set forth in the General Conditions of the Contract and Section 01 4216 are applicable to these Instructions to Bidders.

B. Bid Documents: Contract Documents Instruction to Bidders, Bid Form, Supplements To Bid Forms, Bid Securities, Allowance Breakdown, and Issued Addenda.

C. Contract Documents: Defined in General Conditions. Refer to Section 00 7200 - General Conditions.

D. Bid, Offer, or Bidding: Act of submitting an offer under seal.

E. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

1.10 AVAILABILITY

A. The Contract Documents may be examined at the Office of the Architect, Fuller & D'Angelo Architects and Planners, P.C., 45 Knollwood Road, Elmsford, NY (914) 592-4444; however, complete digital sets of Bidding Documents, drawings and specifications, may be obtained online (with a free user account) as a download for a non-refundable fee of One-Hundred ($100.00) Dollars at the following website: https://revplans.biddyhq.com

B. Please note REVplans (https://revplans.biddyhq.com) is the designated location and means for distributing and obtaining all bid package information. Only those Contract Documents obtained in this manner will enable a prospective bidder to be identified as an official plan holder of record. The Provider takes no responsibility for the completeness of Contract Documents obtained from other sources. Contract Documents obtained from other sources may not be accurate or may not contain addenda that may have been issued

C. All bid addenda will be transmitted to registered plan holders via email and will be available at https://revplans.biddyhq.com. Plan holders who have paid for hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use, and coordinate directly with the printer for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda.

D. Starting December 9, 2024, complete digital sets of Contract Documents shall be obtained online (with a free user account) as a download for a non-refundable fee of One-hunderd (100.00) Dollars at the following website: www.revplans.com under 'public projects'. Optionally, in lieu of digital copies, hard copies may be obtained directly from REV upon a deposit of One Hundred ($100.00) Dollars for each complete set. Checks for deposits shall be made payable to the Brewster Central School District and may be uncertified. All bid addenda will be transmitted to registered plan holders via email and will be available at the above referenced website. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs. Plan holders who have obtained hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use, and coordinate directly with the printer for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda. The bid deposit for hard copies will be returned upon receipt of plans and specifications, in good condition, within thirty days after bid date, except for the lowest responsible bidder, whose check will be forfeited upon the award of the contract.

1.11 EXAMINATION

A. Bid Documents may be viewed at the office of Architect 45 Knollwood Road, Elmsford, NY 10523.

B. Bid Documents may be viewed at the office of Brewster Central School District 30 Farm To Market Road, Brewster, New York 10509

C. Immediately notify Owner's Representative and Architect upon finding discrepancies or omissions in the Bid Documents.

D. Should any conflict occur in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated on the more costly method of doing the work, unless he shall have asked for and obtained a decision in writing from the Architect before the submission of his bid, as to what shall govern.

1.12 INQUIRIES/ADDENDA

A. Questions: Any and all questions about the interpretation or clarification of the Bid Documents, or about any other matter affecting the Work or pertaining to the bid must be directed in writing on the form in Section 00 2115 - RFI Form to the: Architect

Fuller and D'Angelo, P.C.
45 Knollwood Road .
Elmsford, NY 10523 .
Attention: William Means, RA .
Voice: 914-592-4444
E-mail: WilliamM@fullerdangelo.com

B. Answers: The Architect will issue addenda, if necessary, to answer such questions. Bidders shall rely on answers contained in such addenda and **shall not** rely upon any oral answers given by any employee or agent of the Owner's Representative, Architect, Architect's Consultants, and Construction Manager.

1. RFI's not resulting in an addendum may be issued to all plan holders at the discretion of Architect.

C. Addenda are written or graphic instruments issued prior to the Bid Date which modify or interpret the bidding documents, including Drawings and Specifications, by additions, deletions, clarifications or corrections. Addenda will become part of the Contract Documents when the Construction Contract is executed

D. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.

E. Verbal answers are not binding on any party.

F. Clarifications requested by bidders must be in writing not less than 5 days before date set for receipt of bids. The reply will be in the form of an Addendum, if required, a copy of which will be forwarded to known recipients .

1.13 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. Where the Bid Documents stipulate a particular product bidders shall comply with the specifications, performance and quality of the specification item. **The Architect will not review any substitutions during the bidding period.** The bidder assumes all responsibility to meet the requirements and the Architect shall be final authority as to a product is equal to the specification.

B. Refer to Section 01 2500 - Substitution Procedures for substitution requirements.

1.14 SITE EXAMINATION

A. The bidder shall examine the project site before submitting a bid.

B. The bidder may inspect the site at the time of the pre-bid conference if one is scheduled, or at other times by advance agreement with the Owner's Representative and Construction Manager .

1. Contact Owner's Representative at the following address and phone number in order to arrange a date and time to visit the project site: Glen Freyer, Brewster Central School District, 845.279.8000 ext 6111.
2. Bidders who do not inspect the site shall be nevertheless responsible for such information as might have been obtained from a reasonable site inspection

1.15 PREBID CONFERENCE

A. A Bidders Conference has been scheduled for 2:00 PM on December 17, 2024 Bidders shall meet at Mr. Freyers office in the Facilities Building.

B. Attendance is non mandatory. Bidder are strongly advised to attend.

C. All bidders, subcontractors and suppliers are invited.

D. Representatives of Owner, Architect, Architect's Consultants, and Construction Manager will be in attendance.

E. Summarized minutes of this meeting may be circulated to all known bidders. These minutes will not form part of the Contract Documents.

F. Information relevant to the Bid Documents will be recorded in an Addendum, issued to plan holders.

1.16 QUALIFICATIONS

A. Evidence of qualifications:

B. All contractors submitting a bid shall provide official proof of registration with NYSDOL as rtequired by NY Labor Law Section 220-i. Submit proof with bid package. Contract will not be awarded if proof of registration is not submitted.

C. The Owner reserves the right to require additional information it deems appropriate concerning the history of the contractor’s performance of each such contract.

D. In accordance with the requirements of General Municipal Law §103-g, the bidder is required to include with its bid either (1) the “Certification of Compliance with the Iran Divestment Act” or, in the case where the bidder is unable to make such certification, (2) the form titled “Declaration of Bidder’s Inability to Provide Certification of Compliance with the Iran Divestment Act”. Refer to Section 00 4460 - Certification of Compliance With the Iran Disinvestment Act and 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act.

1.17 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. Owner's Representaive, Architect, and Construction Manager reserves the right to reject a proposed subcontractor for reasonable cause.

B. Refer to General Conditions for additional requirements.

1.18 SUBMISSION PROCEDURE

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

B. Submit two copies of the executed offer on the Bid Forms included in the project manual, signed and sealed with the required security in a closed opaque envelope, clearly identified with title of the project, trade, name, address, and telephone number of the bidder and Brewster Central School District's name clearly on the outside.

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

D. To submit a bid for a bid package, the bidder shall photo copy or remove the proposal form **for each bid package from the Project Manual. Then the bidder shall complete, sign and submit the form as required therein If a bidder is bidding on more than one bid package, there must be on fully completed and signed form for each package being bid. The bidder should not submit the entire Project Manual with the bid proposal.**

E. All bid prices shall be filled in, both in words and figures. Signatures shall be in ink and in longhand. Proposals which are incomplete, conditional or obscure may be rejected.

1. In case of a discrepancy between the words and figures, **the written word, not the figures,** will govern.
2. Make no erasures, cross-outs, whiteouts, write-overs, obliteration's, or changes of any kind in the Bid Form phraseology, in the entry of unit prices, or anywhere on the Bid form. Fill in all blanks spaces legibly. An illegible entry may disqualify the bid in its entirety. If a mistake is made, use a new Bid Form. No post bid meetings will be afforded to any bidder to explain or clarify illegible or changed entries.

F. Bidder's shall not rely on oral statements made by any employee or agent of the Owner, Owner's Representative, Architect, and Architect's Consultants. Before submitting a proposal, bidders shall fully inform themselves as to all existing conditions and limitations and shall include in the Proposal a sum to cover the cost of all items included in the Contract

G. No oral or telephonic proposals or modifications of proposals will be considered.

1.19 BID INELIGIBILITY

A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, blanks, or irregularities of any kind, will at the discretion of the Brewster Central School District, be declared unacceptable.

B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Brewster Central School District, be declared unacceptable.

C. Failure to provide security deposit, bonding or insurance requirements will, at the discretion of Brewster Central School District , invalidate the bid.

D. Failure to provide all costs, including Base Bid and Total Base Bids will, at the discretion of Brewster Central School District, invalidate the bid.

1.20 SECURITY DEPOSIT

A. Bids shall be accompanied by a security deposit as follows:
   1. Bid Bond of a sum no less than 10 percent of the Bid Amount on AIA A310 Bid Bond Form, will be required for all Proposals.
   2. Refer to Section 00 6000 - Bonds and Certificates for additional requirements.

B. Endorse the Bid Bond in the name of the Brewster Central School District as obligee, signed and sealed by the principal (Contractor) and surety.

C. The security deposit will be returned after delivery to the Brewster Central School District of the required Performance and Payment Bond(s) by the accepted bidder.

D. Include the cost of bid security in the Bid Amount.

E. After a bid has been accepted, all securities will be returned to the respective bidders .

F. If no contract is awarded, all security deposits will be returned.

1.21 CONSENT OF SURETY

A. Submit with the Bid: The attorney in fact who executes the required bonds on behalf of the surety to affix thereto an original certified and current copy of his power of attorney indicating the monetary limit of such power.

1.22 PERFORMANCE ASSURANCE

A. Accepted Bidder: Shall provide a Performance and Payment Bonds bond, as described in Section 00 6000 - Bonds and Certificates prior to the execution of the Contract, the bidder to furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in such form and amount as the Owner may prescribe and with such sureties secured through the bidder's usual sources as may be agreeable to the parties.

B. Include the cost of Performance and Payment Bonds in the Bid Amount.

C. The bidder shall require the attorney in fact who executes the required bonds on behalf of the surety to affix thereto an original certified and current copy of his power of attorney indicating the monetary limit of such power

1.23 INSURANCE

A. Provide an executed Insurance Certification Section 00 4476 - Insurance Certification attached as a supplement to the proposal.

B. There are special insurance requirements on this project. Refer to Article 11 (AIA 232) of the General Conditions for a summary description of the required coverages. The Owner reserves the right to refuse the award of a Contract to any apparent low bidder who fails to provide the specified insurance certificates at the required time.

C. The Owner, Architect, Consultants, and Construction Manager shall be listed as "Additionally Insured" on all applicable policies.

D. All insurance purchased by Contractor shall constitute primary insurance and primary coverage for all risks insured and that any other liability insurance that Owner, Architect, and Construction Manager may procure or maintain is secondary and that there shall be no contribution by such insurance until insurance provided by the Contractor is exhausted.

1.24 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form and Appendices.

1.25 SALES AND USE TAXES

A. The Owner is a tax exempt entity, therefore there shall be no charge for sales or use taxes. The Owner will document this status as requested.

1.26 FEES FOR CHANGES IN THE WORK

A. Refer to the General Conditions Article 7 (AIA 232) .

1.27 BID FORM SIGNATURE

A. The Bid Form shall be signed by the bidder, 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/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.

1.28 EQUIVALENCY CLAUSE

A. Where, in these specifications, certain kinds, types, brands, or manufacturers of material are named, they shall be regarded as the standard of quality. Where two or less are named the Contractor may select one of those items, subject to meeting the requirements of the specified product. If the contractor desires to use any kind, type, brand, or manufacture of material other than those named in the specification, he shall indicate in writing, and fourteendays after Letter of Award, what kind, type, brand, or manufacture is requesting in lieu of the the specified items. Submit information describing in specific detail, wherein it differs from the quality and performance required by the base specifications, and such other information as may be requested by the Owner.

B. Contractor shall refer to Form in Section 01 2500 - Substitution Procedures.

1.29 NONDISCRIMINATION

A. All Contractors and Subcontractors of all tiers and all vendors shall comply with all pertinent provisions of the State, Local and Federal law against discrimination in employment practices. Refer to Section 01 3306 - Non-Discrimination Clauses.

1.30 PREVAILING WAGES

A. New York State law requires the payment of prevailing wages on the project, as listed in Section 01 3554 - Prevailing Wage Rates.

1.31 ADDITIONAL BID INFORMATION

A. Submit the following Supplements concurrent with bid submission:
   1. Refer to 00 4301 - Bid Form Supplements.
   2. Section 00 6000 - Bonds and Certificates for Bid Bond, Performance and Payment Bond.
   3. Section 00 4401 - Qualification of Bidders.
   4. Section 00 4402 - Hold Harmless Agreement.
   5. Section 00 4460 - Certification of Compliance With the Iran Disinvestment Act **or** Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act.
   6. Section 00 4476 - Insurance Certification.
   7. Consent of Surety
   8. Section 01 2100 - Allowances.
   9. Section 01 2300 - Alternates

B. Each bidder by making his bid represents that he has read and understands the bidding documents.

C. The bidder by making his bid represents that he has visited the site and familiarized himself with the local conditions under which the work is to be performed. Visits to the site shall be arranged through the Owner's Representative.

1.32 SELECTION AND AWARD OF ALTERNATES

A. Indicate variation of bid price for Alternates listed on the Bid Form. Unless otherwise indicated, indicate Alternatives as a difference in bid price by adding to or deducting from the base bid price.

B. Bids will be evaluated on the total of the base bid price and alternatives selected by the Owner.

1.33 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of 45 days after the bid closing date, except as otherwise provided in General Municipal Law §103 (11).

1.34 ACCEPTANCE OF OFFER

A. The bidder acknowledges the right of the Brewster Central School District to reject any or all bids and to waive any informality or irregularity in any bid received. In addition, the bidder recognizes the right of the Owner, at its discretion to reject a bid if the bidder fails to furnish any required bid security, or to submit the information required by the bidding documents, including Section 00 4401 “Qualifications of Bidders”, or if the bid is incomplete or irregular.

1.35 POST-BID PROCEDURE

A. The bid proposal, allowances and information received from owners of other projects will be considered to determine whether the contractor is the “lowest responsible bidder” in making the award. The Architect and Construction Manager may make such investigation as the Architect and Construction Manager deems necessary to determine the responsibility of any bidder or to determine the ability of any bidder to perform the Work. Such investigation shall begin with a review of Section 00 4401 - Qualification of Bidders and shall include such additional information as shall be required herein.

B. When requested by the Architect and Construction Manager, bidders shall furnish all information and data required by the Owner, Architect, and Construction Manager within the time and in the form and manner requested by the Owner. Upon notification from the Construction Manager, the apparent low bidder shall furnish, within Two (2) working days after the bid opening, Two (2) copies of the following information in writing:

1. Evidence of the bidder's financial responsibility, including a certified financial statement prepared by a certified public accountant. The financial statement shall include, but not limited to the following:
   a. Current assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses):
   b. Net Fixed Assets:
   c. Other Assets:
   d. Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes):
   e. Other Liabilities (e.g., Capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).
   f. The names, addresses and phone numbers of the subcontractors and suppliers that the bidder proposes to use on the project.
   g. A bar-chart showing the bidder's proposed plan and schedule to complete the bidder's work in accordance with Section 01 1010 Milestone Schedule.
   h. The insurance certificates required by the Bid Documents.
   i. Resumes for Contractor’s proposed supervisory staff, including qualifications for specialized expertise or any certification(s) required to perform the Work.
   j. Names of proposed major sub-contractors (more than 15% of the bid amount) and a listing of the related trade of work and value.
   k. Any special coordination requirements with other trades.
   l. Any special storage and staging requirements for construction materials.
   m. Any other special requirements.
   n. A proposed schedule of values for the bidder's work.
   o. A proposed list of submittals and a proposed schedule for making them, all keyed to the bar-chart.
2. After receipt of the above information, the Architect and Construction Manager will designate a time and place for the meeting between the Architect and Construction Manager and the apparent low bidder. The apparent low bidder's principal, project manager and site superintendent will attend that meeting, at which time the parties will discuss the bidder's responsiveness, responsibility and qualifications.
3. The Architect and Construction Manager reserves the right to disapprove the use of any proposed Subcontractor, and in such event, the bidder shall submit the name of another Subcontractor in like manner within the time specified by the Architect, as set forth in the Agreement.
4. To the fullest extent allowed by law, the Owner, Architect, and Construction Manager reserves the right to reject any bid if the evidence required by the Architect and Construction Manager is not submitted or fails to satisfy the Architect and Construction Manager that the bidder is responsible, able and qualified to carry out the obligations of the Owner Contract or to complete the Work as contemplated. The Construction Manager will consider the information received in determining whether or not to accept a proposal.
5. Acceptance of a proposal will be a notice in writing signed by a duly authorized representative of the Owner.
6. Any bidder whose proposal is accepted will be required to sign the Owner/Contractor Agreement no later than ten (10) days after notification of Award of Bid or five (5) days following receipt of Contract, whichever is later.

7. In the event that the Owner, Architect, and Construction Manager should reject the proposal of the bidder, the Owner may elect to meet with the next lowest bidder and to consider the information as provided above. In the event that the proposal of the next lowest bidder is rejected, the Construction Manager may elect to meet with the third lowest bidder and repeat the above process. At all times the Owner retains the right to reject all bids.

END OF SECTION

SECTION 00 2115
RFI FORM

CONTRACTOR'S REQUEST FOR INTERPRETATION NO. ____ **F&D RFI NO:_____**
(F&D USE)

NAME OF PROJECT: **CV Starr Cafetorium Addition, Interior Renovation & Related Work**
NAME OF OWNER: **Brewster Central School District**
FACILITY: **CV Starr Intermediate School**
DATE: _____
A/E PROJECT NO: **23505.02**
ARCHITECT: **Architect**
45 Knollwood Road, Elmsford, NY 10523
Tel: 914-592-4444; Fax: 914-592-1717
William Means, RA **WilliamM@fullerdangelo.com**

Refer to Section 00 2113 Par 1.13 for additional requirements.

FROM (CO. NAME):_____
CONTACT NAME: _____
Tel: _____ **E-mail:** _____
SUBJECT: _____
DISCIPLINE/TRADE: _____
DWG./SPEC. REFERENCE: _____
QUESTION: _____
_____
_____
_____

___FIELD CONDITION_____
___ DRAWING/SPEC _____
___ DISCREPANCY_____
___ OWNER CHANGE_____
___ CLARIFICATION _____
___ CONTRACTOR'S SUGGESTION (IF APPLICABLE): _____

ANSWER

_____
_____
_____
_____

ARCHITECT'S SIGNATURE: _____**DATE:**_____

Note: review and any responses to this request for information by the architect/engineer is strictly for design intent only and does not constitute acknowledgement or acceptance of any cost or schedule implications unless specifically presented by the contractor. By submission of this request for information, the contractor assumes all responsibility in the absence of an approved change order or work directive.

END OF SECTION

SECTION 00 4100
BID FORM - CONTRACT #1 GENERAL CONSTRUCTION

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District
30 Farm To Market Road
Brewster, New York 10509

FOR:

CV Starr Cafetorium Addition, Interior Renovation & Related Work at:
CV Starr Intermediate School
20 Farm To Market Road:
Brewster, New York 10509

Project Number: 23505.02

DATE: _____ (Bidder to enter date)

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual and Telephone No. _____

1.1 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Architect for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Contract #1 General Construction Work for the Sum of:

1. BASE BID FOR CV Starr Intermediate School
   a. The Base Bid of this Proposal for all work required by the Contract Documents for Contract # 1 General Construction is as follows:

      _____
      _____($_____) DOLLARS

2. CONTINGENCY ALLOWANCES
   a. The Total Contingency Allowances as indicated in Section 01 2100 - Allowances Allowances is as follows:

      _____($_____) DOLLARS

      Note: Attach Section 01 2100 - Allowances itemized contingency list to bid proposal.

3. TOTAL BASE BID
   a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #1 General Construction and Related Work at the CV Starr Intermediate School is as follows:

      _____
      _____($_____) DOLLARS

B. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in

accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

C. We have included the required security Bid Bond as required by the Instruction to Bidders.

D. We have included the required performance assurance bonds in the Bid Amount as required by the Instructions to Bidders.

E. All applicable federal taxes are included and New York taxes are included in the Bid Sum.

F. All Allowances described in Section 01 2100 - Allowances are included in the Bid Sum.

1.2 ALTERNATES

A. Alternate No. GC-1: Connecting Corridor and SGI Classroom.

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material for all work related to the in accordance with specifications and as shown on the contract drawings.

_____ ($_____) DOLLARS

B. Alternate No. GC-2 :Elevator and Vestibule

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material to provide, furnish and install all work related to the construction of an Elevator and Vestibule in accordance with specifications and as shown on the contract drawings

_____ ($_____) DOLLARS

C. Alternate No. GC-3 : Sight- Proof Louvers

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all labor, equipment and material required to install all work related to the construction of Sight-Proof Louvers and supports in accordance with the specifications and as shown on the contract drawings.

_____ ($_____) DOLLARS

D. Alternate No. -GC-4 : Terrazzo Tile Floor in Cafetorium

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to to provide , furnish and install all labor, equipment and material required to install all work related to Terrazzo Tile Flooring in lieu of the specified Base Bid material,in accordance with the specifications and as shown on the contract drawings.

_____ ($_____) DOLLARS

E. Alternate No. GC-5 - Glazed Block

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to to provide , furnish and install all labor, equipment and material required to install work related to Glazed Block as shown on the contract drawings.

_____ ($_____) DOLLARS

1.3 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date.

B. If this bid is accepted by Brewster Central School District within the time period stated above, we will:

1. Execute the Agreement within seven days of receipt of Notice of Award.
2. Furnish the required bonds within ten days of receipt of Notice of Award.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Brewster Central School District by reason of our 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.

1.4 REJECTION OF BIDS

A. The undersigned agrees that the Owner shall have the right to accept or reject any or all bids.

1.5 CONTRACT TIME

A. If this Bid is accepted, we will:
   1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1010 Milestone Schedule. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the General Conditions.

1.6 CHANGES TO THE WORK

A. Refer to General Conditions.

1.7 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.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.
   5. Addendum # _____ Dated _____.
   6. Addendum # _____ Dated _____.
   7. Addendum # _____ Dated _____.
   8. Addendum # _____ Dated _____.

1.8 BID FORM SUPPLEMENTS

A. The following information is included with bid proposal and submission:
   1. Allowances: In accordance with Section 01 2100.

B. The following shall be are attached to this Bid Form and are considered an integral part of this Bid Form:
   1. Section 004401 - Contractor’s Qualification Statement .
   2. Section 00 4460 - Certification of Compliance with the Iran Disinvestment Act OR
   3. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance.
   4. Section 00 4476 - Insurance Certification.
   5. Section 00 6000 - Project Forms.

1.9 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid or proposal:
   1. The undersigned bidder and the person or persons signing on behalf of the bidder, and should this bid be a joint bid, each party thereto, certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
      a. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.
      b. 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.
      c. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

1.10 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:

1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
3. That said bidder is not in arrears to the Brewster Central School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Brewster Central School District
4. That no member of the Brewster Central School District or any officer or employee of the Brewster Central School District or person whose salary is payable in whole or in part from the said school district treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.11 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)

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.

Subscribed and sworn before me this day of____ 20_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4110
BID FORM - CONTRACT #2 PLUMBING

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District
30 Farm To Market Road
Brewster, New York 10509

FOR:

CV Starr Cafetorium Addition, Interior Renovation & Related Work at:
CV Starr Intermediate School
20 Farm To Market Road
Brewster, New York 10509
Project Number: 23505.02

DATE: _____ (Bidder to enter date)

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual and Telephone No. _____

1.1 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Architect for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Contract #2 Plumbing Work at CV Starr Intermediate School for the Sum of:

1. BASE BID FOR CV Starr Intermediate School
   a. The Base Bid of this Proposal for all work required by the Contract Documents for Contract #2 Plumbing is as follows:

      _____
      _____($_____) DOLLARS

2. TOTAL BASE BID
   a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #2 Plumbing and Related Work at the CV Starr Intermediate School is as follows:

      _____
      _____($_____) DOLLARS

B. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

C. We have included the required security Bid Bond as required by the Instruction to Bidders.

D. All applicable federal taxes are included and New York taxes are included in the Bid Sum.

E. All Allowances described in Section 01 2100 - Allowances are included in the Bid Sum.

F. [The Alternates for this Proposal required by the Contract Documents are listed in Section 01 2300.]

1.2 ALTERNATES

A. Alternate No. PC-1: Connecting Corridor and SGI Classroom

1. The Contractor for Contract #2 Plumbing work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material for all work related to the plumbing of the Connecting Corridor and the SGI Classroom in accordance with specifications and as shown on the contract drawings.

_____ ($_____) DOLLARS

B. Alternate No. PC-2 :Elevator and Vestibule

1. The Contractor for Contract #2 Plumbing work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material to provide all work related to the plumbing of the Elevator and Vestibule in accordance with specifications and as shown on the contract drawings

_____ ($_____) DOLLARS

1.3 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date.

B. If this bid is accepted by Brewster Central School District within the time period stated above, we will:

1. Execute the Agreement within seven days of receipt of Notice of Award.
2. Furnish the required bonds within ten days of receipt of Notice of Award.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Brewster Central School District by reason of our 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.

1.4 REJECTION OF BIDS

A. The undersigned agrees that the Owner shall have the right to accept or reject any or all bids

1.5 CONTRACT TIME

A. If this Bid is accepted, we will:

1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1010 Milestone Schedule. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the General Conditions.

1.6 CHANGES TO THE WORK

A. Refer to General Conditions.

1.7 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.

1. Addendum # _____ Dated _____.
2. Addendum # _____ Dated _____.
3. Addendum # _____ Dated _____.
4. Addendum # _____ Dated _____.
5. Addendum # _____ Dated _____.
6. Addendum # _____ Dated _____.
7. Addendum # _____ Dated _____.
8. Addendum # _____ Dated _____.

1.8 BID FORM SUPPLEMENTS

A. The following information is included with bid proposal and submission:

B. The following shall be are attached to this Bid Form and are considered an integral part of this Bid Form:
   1. Section 00 4400 - Qualifications of Bidders.
   2. Section 004401 - Contractor's Qualification Statement .
   3. Section 00 4460 - Certification of Compliance with the Iran Disinvestment Act OR
   4. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance.
   5. Section 00 4476 - Insurance Certification.
   6. Section 00 6000 - Project Forms.
   7. Section 01 2100 - Allowances: Itemized contingency allowance list.

1.9 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid or proposal:
   1. The undersigned bidder and the person or persons signing on behalf of the bidder, and should this bid be a joint bid, each party thereto, certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
      a. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.
      b. 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.
      c. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

1.10 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:
   1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
   2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
   3. That said bidder is not in arrears to the Brewster Central School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Brewster Central School District
   4. That no member of the Brewster Central School District or any officer or employee of the Brewster Central School District or person whose salary is payable in whole or in part from the said school district treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
   5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
   6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.11 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)

_____

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.

Subscribed and sworn before me this day of____ 20_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4120
BID FORM - CONTRACT #3 HVAC

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District

30 Farm To Market Road

Brewster, New York 10509

FOR:

CV Starr Cafetorium Addition, Interior Renovation & Related Work at:

CV Starr Intermediate School

20 Farm To Market Road:

Brewster, New York 10509

Project Number: 23505.02

DATE: _____ (Bidder to enter date)

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual and Telephone No. _____

1.1 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Architect for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Contract #3 HVAC Work at CV Starr Intermediate School for the Sum of:

1. BASE BID FOR CV Starr Intermediate School
   a. The Base Bid of this Proposal for all work required by the Contract Documents for Contract #3 HVAC is as follows:

      _____
      _____($_____) DOLLARS

2. COMMISSIONING ALLOWANCE
   a. The Total Contingency Allowances as indicated in Section 01 2100 - Allowances. Allowances is as follows:

      _____($_____) DOLLARS

      Note: Attach Section 01 2100 - Allowances itemized contingency list to bid proposal.

3. TOTAL BASE BID
   a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #3 Heating, Ventilation and Air Conditioning and Related Work at the CV Starr Intermediate School is as follows:

      _____
      _____($_____) DOLLARS

B. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full

compensation therefore the amount of the Total Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

C. We have included the required security Bid Bond as required by the Instruction to Bidders.

D. All applicable federal taxes are included and New York taxes are included in the Bid Sum.

E. All Allowances described in Section 01 2100 - Allowances are included in the Bid Sum.

1.2 ALTERNATES

A. The Alternates for this Proposal required by the Contract Documents are listed in Section 01 2300.

B. Alternate No. HC-1: Connecting Corridor and SGI Classroom

1. The Contractor for Contract #3 HVAC work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material for all all work related to the HVACfor the Connecting Corridor and SGI Classroom in accordance with specifications and as shown on the contract drawings.

_____ ($_____) DOLLARS

C. Alternate No. HC-2 :Elevator and Vestibule

1. The Contractor for Contract #3 HVAC work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material to provide all work related to the HVAC of the Elevator and Vestibule in accordance with specifications and as shown on the contract drawings

_____ ($_____) DOLLARS

1.3 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date.

B. If this bid is accepted by Brewster Central School District within the time period stated above, we will:

1. Execute the Agreement within seven days of receipt of Notice of Award.
2. Furnish the required bonds within ten days of receipt of Notice of Award.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Brewster Central School District by reason of our 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.

1.4 REJECTION OF BIDS

A. The undersigned agrees that the Owner shall have the right to accept or reject any or all bids

1.5 CONTRACT TIME

A. If this Bid is accepted, we will:

1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1010 Milestone Schedule. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the General Conditions.

1.6 CHANGES TO THE WORK

A. Refer to General Conditions.

1.7 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.

1. Addendum # _____ Dated _____.
2. Addendum # _____ Dated _____.
3. Addendum # _____ Dated _____.
4. Addendum # _____ Dated _____.

5. Addendum # _____ Dated _____.
6. Addendum # _____ Dated _____.
7. Addendum # _____ Dated _____.
8. Addendum # _____ Dated _____.

1.8 BID FORM SUPPLEMENTS

A. The following information is included with bid proposal and submission:

B. The following shall be are attached to this Bid Form and are considered an integral part of this Bid Form:
1. Section 004401 - Contractor's Qualification Statement .
2. Section 00 4460 - Certification of Compliance with the Iran Disinvestment Act OR
3. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance.
4. Section 00 4476 - Insurance Certification.
5. Section 00 6000 - Project Forms.

1.9 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid or proposal:
1. The undersigned bidder and the person or persons signing on behalf of the bidder, and should this bid be a joint bid, each party thereto, certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
   a. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.
   b. 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.
   c. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

1.10 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:
1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
3. That said bidder is not in arrears to the Brewster Central School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Brewster Central School District
4. That no member of the Brewster Central School District or any officer or employee of the Brewster Central School District or person whose salary is payable in whole or in part from the said school district treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.

6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.11 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)

_____

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.

Subscribed and sworn before me this day of____ 20_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4130
BID FORM - CONTRACT #4 ELECTRICAL

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District

30 Farm To Market Road

Brewster, New York 10509

FOR:

CV Starr Cafetorium Addition, Interior Renovation & Related Work at:

CV Starr Intermediate School

20 Farm To Market Road:

Brewster, New York 10509

Project Number: 23505.02

DATE: _____ (Bidder to enter date)

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual and Telephone No. _____

1.1 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Architect for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Contract #4 Electrical Work at CV Starr Intermediate School for the Sum of:

1. BASE BID FOR CV Starr Intermediate School

   a. The Base Bid of this Proposal for all work required by the Contract Documents for Contract #4 Electrical is as follows:

   _____
   _____($_____) DOLLARS

   TOTAL BASE BID

   a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #4 Electrical and Related Work at the CV Starr Intermediate School is as follows:

   _____
   _____($_____) DOLLARS

B. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

C. We have included the required security Bid Bond as required by the Instruction to Bidders.

D. All applicable federal taxes are included and New York taxes are included in the Bid Sum.

E. All Allowances described in Section 01 2100 - Allowances are included in the Bid Sum.

1.2 ALTERNATES -

A. The Alternates for this Proposal required by the Contract Documents are listed in Section 01 2300.

B. Alternate No. EC-1:

1. The Contractor for Contract #4 Electrical work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material for all work related to the Connecting Corridor and SGI Classroom in accordance with specifications and as shown on the contract drawings.

_____ ($_____) DOLLARS

C. Alternate No. EC-2 :Elevator and Vestibule

1. The Contractor for Contract #4 Electrical work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material for all work related to the Electrical of an Elevator and Vestibule in accordance with specifications and as shown on the contract drawings

_____ ($_____) DOLLARS

1.3 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date.

B. If this bid is accepted by Brewster Central School District within the time period stated above, we will:

1. Execute the Agreement within seven days of receipt of Notice of Award.
2. Furnish the required bonds within ten days of receipt of Notice of Award.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Brewster Central School District by reason of our 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.

1.4 REJECTION OF BIDS

A. The undersigned agrees that the Owner shall have the right to accept or reject any or all bids

1.5 CONTRACT TIME

A. If this Bid is accepted, we will:

1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1010 Milestone Schedule. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the General Conditions.

1.6 CHANGES TO THE WORK

A. Refer to General Conditions.

1.7 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.

1. Addendum # _____ Dated _____.
2. Addendum # _____ Dated _____.
3. Addendum # _____ Dated _____.
4. Addendum # _____ Dated _____.
5. Addendum # _____ Dated _____.
6. Addendum # _____ Dated _____.
7. Addendum # _____ Dated _____.
8. Addendum # _____ Dated _____.

1.8 BID FORM SUPPLEMENTS

A. The following information is included with bid proposal and submission:
   1. Alternates: In accordance with Section 01 2300.
   2. Allowances: In accordance with Section 01 2100.

B. The following shall be are attached to this Bid Form and are considered an integral part of this Bid Form:
   1. Section 2200 - Unit Prices: Include a listing of unit prices specifically requested by the Contract Documents. Include the cost variations to the Bid Sum applicable to the Work as described..
   2. Section 00 4400 - Qualifications of Bidders.
   3. Section 00 4460 - Certification of Compliance with the Iran Disinvestment Act OR
   4. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance.
   5. Section 00 4476 - Insurance Certification.
   6. Section 00 6000 - Project Forms.

1.9 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid or proposal:
   1. The undersigned bidder and the person or persons signing on behalf of the bidder, and should this bid be a joint bid, each party thereto, certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
      a. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.
      b. 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.
      c. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

1.10 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:
   1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
   2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
   3. That said bidder is not in arrears to the Brewster Central School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Brewster Central School District
   4. That no member of the Brewster Central School District or any officer or employee of the Brewster Central School District or person whose salary is payable in whole or in part from the said school district treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
   5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.

6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.11 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)

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.

Notary Public: _____ My Commission Expire: _____

Subscribed and sworn before me this day of____ 20____

END OF BID FORM

SECTION 00 4301
BID FORM SUPPLEMENTS

PARTICULARS

TO: Brewster Central School District

ARCHITECTS PROJECT NUMBER: 23505.02

PROJECT DESCRIPTION: CV Starr Cafetorium Addition, Interior Renovation & Related Work

Date: _____

Please type form.

SUBMITTED BY: (BIDDER TO INSERT FULL NAME AND ADDRESS)

_____

_____

_____

Tel: _____E-Mail: _____

A. In accordance with Section 00 2113 - Instructions to Bidders and Bid Form - we include the Supplements To Bid Form listed below. The information provided shall be considered an integral part of the Bid Form.

1.1 SUPPLEMENTS TO BID FORM

A. Proof of registration with NYSDOL.

B. Section 00 6000 - Bonds and Certificates

C. Section 00 4401 - Qualification of Bidders.

D. Section 00 4402 - Hold Harmless Agreement.

E. Section 00 4460 - Certification of Compliance With the Iran Disinvestment Act OR

F. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act.

G. Section 00 4476 - Insurance Certification.

H. Section 01 2100 - Allowances.

I. Section 01 2300 - Alternates.

SIGNATURE(S)

The Corporate Seal of

_____

(Bidder please type the full name of Authorized signing Officer, Title of your Proprietorship, Partnership, or Corporation)

subscribed and sworn before me this day of____ 202_____

_____

Notary Public: _____

My Commission Expire: _____

(Authorized signing officer Title)

END OF SECTION

SECTION 00 4401
QUALIFICATION OF BIDDERS

1.1 REQUIREMENTS

A. The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

B. With the submittal of the Bid Proposal Form, **the bidder shall attach this Qualification of Bidders** and shall answer all the questions and provide all information requested herein. Failure to answer these questions or provide information requested in full may be cause for rejection of the bidder's proposal. If more space is needed, attach additional sheets with reference to subject paragraph.

C. The Owner reserves the right to consider, but not limited to, the bidder's financial responsibility, integrity, experience and reputation in the construction industry, as well as the specific qualifications listed below and elsewhere in this document in considering bids and awarding the contract. Brewster Central School District reserves the right to waive any informalities if, at its discretion the interest of the Brewster Central School District will be better served.

D. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of financial position and current commitments, license to perform work in the State NY .

E. To be considered qualified, in addition to the items listed in the Contractor's Qualification Statement, bidder must demonstrate to the Owner's satisfaction that:

1. A Principal of the corporation, partnership, sole proprietorship of the entity in whose name the bid is submitted has no less than the previous ten (10) years performing or coordinating the Work which they are bidding on.

F. The bidder is not currently involved in bankruptcy proceedings.

G. The bidder is capable of and intends to perform the work with its own employees in accordance with Article 5.2.5 of the General Conditions.

1. The bidder is capable of and intends to perform the work with its own employees in accordance with the following:
   a. Not withstanding any other provisions of the Contract Documents, Contractor shall perform at least twenty-five (25)% of the field work by its own employees.
   b. Not withstanding any other provisions of the Contract Documents of the field work by its own employees Contractors for Electrical shall perform at least seventy-five (75)% of the field work by its own employees.
   c. For the purpose of the preceding paragraph, any part of the work performed by supervisory personnel (persons above level of foreman) or by the office personnel and such items as bonds, certificates, shop drawings and similar items shall not be considered part of the percentage of work required to be performed by the Contractor's employees.

H. Each subcontractor must have a minimum of five (5) years experience in the work and/or applicable trade.

I. The bidder will perform the work with sufficient personnel as required to comply with the schedule.

J. Field Superintendent must have at least five (5) years experience as a working field superintendent and must speak English or have a translator available at all times at no cost to the Owner.

K. Each Company (Bidder) shall have successfully completed three (3) public school construction or other public work projects within the last five (5) years substantially similar in scope, size, complexity and dollar value to the work of this project.

L. Each Company (Bidder) shall furnish, on the attached form, the three (3) three public school or public works projects it has performed during the most recent five (5) years including, but not limited to, the name and address of the project, the name of the awarding entity/owner, the name of the awarding

entity's/owner's representative, construction manager and architect, current telephone numbers where each can be reached, the description of the project, general scope of the contractor's work, contract price, dates of performance, whether the contract was terminated for cause or convenience, whether the contract was completed on time and whether liquidated damages were assessed against the contractor, and if so, to any items above provide a written explanation.

1. The Owner's Representative and Architect reserves the right to require additional information it deems appropriate concerning the history of the contractor's performance of each such contract.

M. The final determination of whether the contractor possesses the requisite experience rests in the sole discretion of the Owner.

1.2 QUESTIONAIRE:

A. **All information must be typewritten. Handwritten information will be rejected.**

Submitted to: Brewster Central School District

Address: 30 Farm To Market Road

City/Town: Brewster, New York 10509

Submitted By: _____

Tele #: _____ E-mail: _____

Corporation _____Partnership _____ Individual_____

Address:_____

Principal Office:_____

Other: _____

Project: CV Starr Cafetorium Addition, Interior Renovation & Related Work

Facility: CV Starr Intermediate School

1.3 ORGANIZATION

A. **All information must be typewritten. Handwritten information will be rejected.**

B. How many years has your organization been in business as a Contractor? _____

1. How many years has your organization been in business under its present business name? _____
2. Under what other or former names has your organization operated?

_____

_____

C. What is the firm's bonding range?

Single:_____ Aggregate: _____

D. If your organization is a corporation, answer the following:

1. Date of Incorporation: _____
   a. State of Incorporation: _____
   b. President's Name:_____
   c. Vice-president's name(s): _____
   d. Secretary's name: _____
   e. Treasurer's name: _____

E. If your organization is a partnership, answer the following:

1. Date of organization:_____
   a. Type of partnership (if applicable):_____ _____
   b. Name(s) of general partner(s): _____

_____

F. If your organization is individually owned, answer the following:

1. Date of organization:_____
2. Name of owner: _____

G. If the form of your organization is other than those listed above, describe it and name the principals:

_____

_____

1.4 OWNERSHIP, MANAGEMENT, AFFILIATION

A. Identify each person who is or has been ,within the past five years, an owner of 5.0% or more of the firm's shares, one of the five largest shareholders, a director, an officer, a partner or the proprietor, or a managerial employee.

First Name: _____MI___Last Name_____DOB_____

% Owned: __ Director: Yes__ No__ Officer: Yes__ No__ Title _____artner: Yes__ No____

First Name: _____MI____Last Name_____DOB_____

% Owned: __ Director: Yes__ No__ Officer: Yes__ No__ Title _____Partner: Yes__ No_____

First Name: _____MI____Last Name_____DOB_____

% Owned: __ Director: Yes__ No__ Officer: Yes__ No__ Title _____Partner: Yes__ No____

B. Has the firm or any firm listed in response to questions above defaulted or been terminated and its surety called upon to complete, any contract awarded within the past five years Yes ___ No ___ If yes, give date(s), agency (ies)/owner(s), project(s), contract numbers, and describe including the result:

_____

_____

C. List below any projects performed by the bidder in the past five (5) years on which any of the following events occurred:

1. Were any extension of time were requested by the contractor, Yes__ No __and were such requests granted? Yes__ No __
2. Was litigation and/or arbitration commenced by either the Owner or the bidder as a result of the work of the project performed by the bidder? Yes __ No __
3. Were any liens filed on the project by subcontractors or material suppliers of the bidder? Yes__ No __
4. Did the bidder make any claims for extra work on the project, and did said claim result in a change order? Yes__ No ___
5. If Yes:

Project Name/Address_____

Type of Event_____

Name & Phone # of Owner: _____

Contact Person at Owner: _____

D. For all contracts within the past five years: (a) List all liens or claims over $25,000 filed against the firm and remaining undischarged or unsatisfied for more than 90 days; and (b) list and describe all liquidated damages assessed: _____

_____

1.5 FINANCIAL INFORMATION

A. Submit firm's most recent annual financial statement and Dun and Bradstreet Report..

1.6 OTHER INFORMATION

A. Within the past five years has the firm, any affiliate, any predecessor company or entity or any person identified in questions number 1.1 through 1.2 above been the subject of any of the following: (Respond

to each question and describe in detail the circumstances of each affirmative answer: (Attach additional pages if necessary).

1. A judgment of conviction for any business-related conduct constituting a crime under state or federal law No__ Yes__
2. A criminal investigation or indictment for any business-related conduct constituting a crime under state or federal law? No__ Yes__
3. A grant of immunity for any business-related conduct constituting a crime under state and federal law? No__ Yes__
4. A federal or state suspension or debarment? No__ Yes__
5. A rejection of any bid for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid? No__ Yes__
6. A denial or revocation of prequalification? No__ Yes__
7. A voluntary exclusion from bidding/contracting agreement? No__ Yes__
8. Any administrative proceeding or civil action seeking specific performance or restitution in connection with any public works contract except any disputed work proceeding? No__ Yes__
9. An OSHA Citation and Notification of Penalty containing a violation classified as serious? No__ Yes__
10. An OSHA Citation or Notification of Penalty containing a violation classified as willful? No__ Yes__
11. A prevailing wage or supplement payment violation? No__ Yes__
12. A State Labor Law violation deemed willful? No__ Yes__
13. Any other federal or state Citations, Notices, violation orders, pending administrative hearings or proceedings or determinations of a violation of any labor law or regulation? No__ Yes__
14. Any criminal investigation, felony indictment or conviction concerning formation of or any business association with, an allegedly false or fraudulent women's, minority or disadvantaged business enterprise? No__ Yes_
15. Any denial, desertification, revocation or forfeiture of Women's Business Enterprise, Minority Business Enterprise or Disadvantaged Business Enterprise status? No__ Yes_
16. Rejection of a low bid on a State contract for failure to meet statutory affirmative action M/WBE requirements? No__ Yes_
17. A consent order with the NYS Department of Environmental Conservation or a federal, state or local government enforcement determination involving a violation of federal or state environmental laws? No__ Yes_
18. Any bankruptcy proceeding? No__ Yes__
19. Any suspension or revocation of any business or professional license? No__ Yes_
20. Any citations, notices, violation orders, pending administrative hearings or proceedings or determinations for violation of hearings or proceedings or determinations for violation of:
    a. Federal, state or local health laws, rules or regulations? No__ Yes_
    b. Federal, state or local environmental laws, rules and regulations? No__ Yes_
    c. Unemployment insurance or workers compensation coverage or claim requirements. No__ Yes_
    d. ERISA (Employee Retirement Income Security Act) No__ Yes_
    e. Federal, state or local human rights laws. No__ Yes_
    f. Federal, state or local labor laws. No__ Yes__
    g. Federal or state security laws. No__ Yes_
    h. Withdrawal or an agreement to withdraw a bid submitted to a public owner or a request by a public owner to withdraw a bid? No__ Yes_

B. During the five year period preceding the submissions of this bid, has the bidder been named as a party in any lawsuit in an action involving a claim for personal injury or wrongful death arising from performance

of work related to any project in which it has been engaged? If the answer to this question is yes, list all such lawsuits, the index number associated with said suit and the status of the lawsuit at the time of the submission of this bid. No__ Yes_

C. During the five year period preceding the submission of this bid, has the bidder been the subject of proceedings before the Department of Labor for alleged violations of the Labor Law as it relates to the payment of prevailing wages and/or supplemental payment requirements? If the answer to this question is yes, please list each such instance of the commencement of a Department of Labor proceeding, for which project such proceeding was commenced, and the status of the proceeding at the time of the submission of this bid. No__ Yes_

D. During the five year period preceding the bidder's submission of this bid, has the bidder been the subject of proceedings involving allegations that it violated the Worker's Compensation Law including but not limited to the failure to provide proof of worker's compensation or disability coverage and/or any lapses thereof. If the answer to this question is yes, list such instance of violation and the status of the claimed violation at the time of disposition of this bid. No__Yes __

E. Has the bidder, its officers, directors, owner and/or managerial employees been convicted of a crime or been the subject of a criminal indictment during the five years preceding the submission of this bid? If the answer to this question is yes, list the name of the individual convicted or indicted the charge against the individual and the date of submission of the charge. No__Yes__

F. During the five year period preceding the bidder's submission of this bid, has the bidder been charged with and/or found guilty of any violations of federal, state, or municipal environmental and/or health laws, codes, rules and/or regulations. If the answer to this question is yes, list the nature of the charge against the bidder, the date of the charge, and the status of the charge at the time of the submission of this bid. No__ Yes_

G. Has the bidder ever defaulted or had its surety called upon to complete any contract awarded within the past five years. If the answer to this question is yes, list the projects, the dates and the nature of the termination (convenience, suspension, for cause). No__ Yes_

H. Has any officer or partner of the bidder's organization ever defaulted or had its surety called upon to complete any contract awarded within the past five years or been an officer or partner of some other organization that has been terminated from a project by an owner? If yes, state: No__ Yes__

I. Name of Individual(s) _____ Name of Organization(s) Reason(s)

_____

_____

1.7 LICENSING

A. List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration of license numbers, if applicable.

_____

_____

B. List jurisdictions in which your organization's partnership or trade name is filed:

_____

_____

C. Has any director, officer, owner or managerial employee had any professional license suspended or revoked? If the answer is yes, list the name of the individual, the professional license he/she formally had, whether the license was revoked or suspended and the date of the revocation or suspension. No__ Yes__

1.8 EXPERIENCE

A. List the categories of work that your organization will perform with its own forces:

_____

_____

B. Claims and Suits. (If the answer of any of the questions below is yes, please attach details.)

1. Have you or has any director, officer, owner or managerial employee ever failed to complete any work awarded to them? If yes, list the project(s) the date(s) and the reason(s) for the failure to complete. No____ Yes___
2. Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers? No____ Yes_____
3. Has your organization filed or been party to any law suits or requested arbitration proceedings with regard to construction contracts within the last five years? No____ Yes____
4. Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.) No____ Yes____

C. On a separate sheet, list all construction projects presently your organization has in progress or completed, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

D. State total worth of work in progress and under contract:

_____

E. On a separate sheet, list all projects, not listed above, that your organization has completed or in progress in the past five years, giving the name of the project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

F. State average annual amount of construction work performed during the past five years: _____

_____

G. On a separate sheet, list the construction experience and present commitment of the key individuals of your organization.

1.9 APPRENTICE PROGRAM

A. Has the Firm have in place apprenticeship agreements appropriate for the type and scope of work to be performed, that have been registered with, and approved by, the Commissioner of the New York State Department of Labor pursuant to the requirements found in Article 23 of the Labor Law. No__ Yes_

1.10 REFERENCES

A. Trade reference: _____

B. Bank references: _____

C. Surety: _____

1. Name of present bonding company: _____
2. Name and address of agent: _____
3. Name or previous bonding company: _____

1.11 CERTIFICATION

A. The undersigned recognizes that this questionnaire is submitted for the purpose of the Brewster Central School District awarding a contract or approving a subcontract; acknowledges that the Brewster Central School District may in its discretion, by means which it may choose, determine the truth and accuracy of all statements made herein; acknowledge that intentional submission of false or misleading information may constitute a felony under Penal Law §210.40 or a misdemeanor under Penal Law §210.35 or §210.45, and may also be punishable by a fine of up to $10,000.00 or imprisonment of up to five years under 18 U.S.C. §1001; and states that the information submitted in this questionnaire any attached pages is true, accurate and complete.

Dated at this day of _____

Name of Organization: _____

By: _____Title_____

being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading. Subscribed and sworn before me this day of:_____

Notary Public: _____My Commission Expire: _____

See Project Information Form attached.

PROJECT NAME: _____

Company work was performed under: _____

Who was Co. Principal in charge: _____

Location: _____

Cost of the Contract: _____ Final Cost of the Work: _____

Description of the Work:

_____

_____

_____

Owner's Name:

_____

Owners Contact: Name _____ Phone_____ E-Mail _____

CM Name(If Applicable: _____

CM Contact: Name _____ Phone_____E-Mail_____

Architect Firm: _____

Architect Contact: _____PhoneE_____ E-Mail_____

PROJECT NAME: _____

Company work was performed under: _____

Who was Co. Principal in charge: _____

Location: _____

Cost of the Contract: _____ **Final Cost of the Work:** _____

Description of the Work:

_____

_____

_____

Owner's Name:

_____

Owners Contact: Name _____ **Phone**_____ **E-Mail** _____

CM Name(If Applicable: _____

CM Contact: Name _____ **Phone**_____**E-Mail**_____

Architect Firm: _____

Architect Contact: _____**PhoneE**_____ **E-Mail**_____

PROJECT NAME: _____

Company work was performed under: _____

Who was Co. Principal in charge: _____

Location: _____

Cost of the Contract: _____ **Final Cost of the Work:** _____

Description of the Work:

_____

_____

_____

Owner's Name:

_____

Owners Contact: Name _____ **Phone**_____ **E-Mail** _____

CM Name(If Applicable: _____

CM Contact: Name _____ **Phone**_____**E-Mail**_____

Architect Firm: _____

Architect Contact: _____**PhoneE**_____ **E-Mail**_____

END OF SECTION

SECTION 00 4402
HOLD HARMLESS AGREEMENT

_____herein the "CONTRACTOR" assumes responsibility for any and all injury to or death of any and all persons, including the CONTRACTOR'S agents, servants and employees, and in addition thereto, for any and all damages to property caused by or resulting from or arising out of any act or omission in connection with this contract or the prosecution of work hereunder, whether caused by the CONTRACTOR or the CONTRACTOR'S agents, servants or employees, or the CONTRACTOR'S subcontractors or suppliers, and the CONTRACTOR shall indemnify and hold harmless the Owner, Architect, and Construction Manager, their employees and consultants from and against any and all loss and/or expense which they or either of them may suffer or pay as a result of claims or suits due to, because of or arising out of any and all such injuries, deaths and/or damage. The CONTRACTOR if requested, shall assume and defend at the CONTRACTOR'S own expense, any suit, action or other legal proceedings arising therefrom, and the CONTRACTOR hereby agrees to satisfy, pay and cause to be discharged of record any judgment which may be rendered against the owner or architect arising therefrom.

Dated at _____ this day of 202___ .

Signed, Sealed and Delivered

SIGNED _____

Name_____
Title_____

in the presence of by:

Name_____Title_____

SECTION 00 4440
OWNER SUPPLIED CONTRACTOR INSTALLED ITEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing material and equipment that will be furnished by the owner and installed by the Electrical Contractor.

1.3 OWNER-FURNISHED PRODUCTS

A. Owner will furnish the following:
   1. High-Tech Security Upgrades
      a. All security components and equipment as shown on SE series drawings.
      b. All software required for security system operation.
      c. All programing of equipment provided by Owner.
      d. Licensing and subscription fees of software and hardware components.

B. The Work includes providing support systems to receive Owner's equipment, complete full installation of all equipment and to complete all field writing to equipment shown.
   1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor as applicable.
   2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
   3. Owner will arrange for integrators field services .
   4. Contractor shall provide to the Owner the earliest possible delivery date required for Owner-furnished products. Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
   5. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect and Construction Manager noting discrepancies or anticipated problems in use of product.
   6. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
   7. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.

C. Related Sections include the following:
   1. Section 26 0519 Low-Voltage Electric Power Conductors
   2. Section 26 0533. Conduit for Electrical Systems
   3. Section 27 1000 Structured Cabling
   4. Appendix - Security Equipment Cuts

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.

B. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.

C. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.

3.2 INSTALLATION

A. Coordinate materials and their installation with related materials and installations to ensure that each item is completely integrated and interfaced with related work.

B. Installation shall conform to the requirements of each section.

C. All preparation, fasteners, devices etc, required for a complete installation shall be provided by the contractor.

D. Contractor shall install all components in accordance with Manufacturer's and Integrator's requirements.

E. Contractor shall assist integrator in final adjustments and setup of all equipment installed.

END OF SECTION

SECTION 00 4460
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:

By entering into this Contract, Contractor certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at:

http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf

and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Contractor agrees that should it seek to renew or extend this Contract, it must provide the same certification at the time the Contract is renewed or extended. Contractor also agrees that any proposed Assignee of the Contract will be required to certify that it is not on the Prohibited Entities List before Brewster Central School District may approve a request for Assignment of Contract. During the term of the Contract, should Brewster Central School District receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then Brewster Central School District shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default. Brewster Central School District reserves the right to reject any request for renewal, extension, or assignment for an entity that appears on the Prohibited Entities List prior to the renewal, extension, or assignment of the Contract, and to pursue a responsibility review with Contractor should it appear on the Prohibited Entities List hereafter.http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf

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

_____

SIGNED

SWORN to before me this

_____ day of _____202___

END OF SECTION

SECTION 00 4470
DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT.

Bidders shall complete this form if they cannot certify that the bidder /contractor or any proposed subcontractor is not identified on the Prohibited Entities List. The District reserves the right to undertake any investigation into the information provided herein or to request additional information from the bidder.

Name of the Bidder: _____

Address of Bidder: _____

Has bidder been involved in investment activities in Iran? _____

Describe the type of activities including but not limited to the amounts and the nature of the investments (e.g. banking, energy, real estate)

_____
_____
_____

If so, when did the first investment activity occur? _____

Have the investment activities ended? _____

If so, what was the date of the last investment activity? _____

If not, have the investment activities increased or expanded since April 12, 2012? _____

Has the bidder adopted, publicized, or implemented a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran? _____

If so, provide the date of the adoption of the plan by the bidder and proof of the adopted resolution, if any and a copy of the formal plan. _____

In detail, state the reasons why the bidder cannot provide the Certification of Compliance with the Iran Divestment Act below (additional pages may be attached):

_____
_____
_____
_____
_____
_____
_____

I, _____ being duly sworn, deposes and says that he/she is the _____ of the _____ Corporation and the foregoing is true and accurate.

_____

SIGNED

SWORN to before me this

_____ day of _____

202___

Notary Public: _____

SECTION 00 4476
INSURANCE CERTIFICATION

BID OR PROJECT NO. # 23505.02

NAME OF PROJECT: CV Starr Cafetorium Addition, Interior Renovation & Related Work

CV Starr Intermediate School

Insurance Representative's Acknowledgement:

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

INSURANCE REPRESENTATIVE: _____

ADDRESS: _____

Are you an agent for the companies providing the coverage?

Yes_____No_____

DATE:_____

_____

Insurance Representative (Name)

Bidder's Acknowledgement:

I acknowledge that I have received the insurance requirements of this bid and have considered the costs, if any, of procuring the required insurance and will be able to supply the insurance required in accordance with the bid, if it is awarded. I understand that a certificate of insurance must be submitted with my contract and if it is not, the Brewster Central School District will reject my bid and award to the next lowest bidder.

FIRM NAME:

_____

ADDRESS: _____

DATE:_____

_____

Bidder's Signature

INSURANCE SUBMISSION UPON AWARD OF CONTRACT

Immediately upon the issuance of the Notice of Award, the Bidder shall submit the Insurance requirements for approval as directed by the Owner.

SECTION 00 5200
AGREEMENT FORM

PART 1 GENERAL

1.1 FORM OF AGREEMENT

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

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

B. Section 01 4216 - Definitions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

DRAFT AIA® Document A132™ – 2019

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

AGREEMENT made as of the « » day of « » in the year « »

BETWEEN the Owner:

« Brewster Central School District»« »
«30 Farm to Market Road»
« Brewster, New York 10509 »
« »

and the Contractor:

« »« »
« »
« »
« »

for the following Project:

« C.V. Starr Intermediate School»
« Cafetorium Addition, Interior Renovation & Related Work »
« »

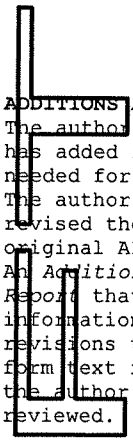
The Construction Manager:

« Triton Construction Company, LLC»« »
«30 East 33rd St., 11th Floor»
« New York, New York 10016 »
« »

The Architect:

Fuller & D'Angelo, PC
45 Knollwood Road
Elmsford NY 10523

The Owner and Contractor agree as follows.



ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

.1 A date set forth in or Letter of Award issued by the Owner.

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

§ 3.3 Substantial Completion of the Project or Portions Thereof

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

.1 As indicated in **Section 01100-Summary of Contracts Section 01 1010 Milestone Schedule** or for various phases, if any, of work and overall completion.

»

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

Portion of Work	Substantial Completion Date
	As indicated in § 3.3.1 above

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

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:

(Check one of the following boxes and complete the necessary information.)

[« »] By the following date: « As indicated in § 3.3.1 above »

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

Portion of Work	Date to be substantially complete
	As indicated in § 3.3.1 above.

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

ARTICLE 4 CONTRACT SUM

§ 4.1 Stipulated Sum

§ 4.1.1 The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

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

Item	Price

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

Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:

Item	Price

§ 4.2.4 Unit prices, if any:

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Liquidated damages, if any:

As indicated in Article 8 of the General Conditions »

«None»

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments (Refer to Section 01 2000 Price and Payment Procedures for Additional Requirements).

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

§ 5.1.1.1 Provide a separate application for each school building. Include the SED and Fuller and D'Angelo's project number

§ 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:

.1 As indicated in Section 00 5200 Form of Agreement.

§ 5.2 Final Payment

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

§ 5.2.1.1 Refer to Sectioon 01 7800 Closeout Submittals

.1 As indicated in Section 01 7800 Closeout Submittals »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.

§ 6.2 Binding Dispute Resolution

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

.1 Litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

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

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:

«To be negotiated between Owner and Contractor. Failure to agree the issue shall be resolved in a court of competent jurisdiction.
»

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

§ 7.2 Suspension

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner's representative:

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:

« »
« »
« »
« »
« »

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

§ 8.5 Insurance and Bonds

§ 8.5.1 Refer to Section 00 6000.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

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

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

.3 Drawings

Number	Title	Date
Refer to Exhibit A		

.4 Specifications

Section	Title	Date	Pages
Refer to Exhibit B			

.5 Addenda, if any:

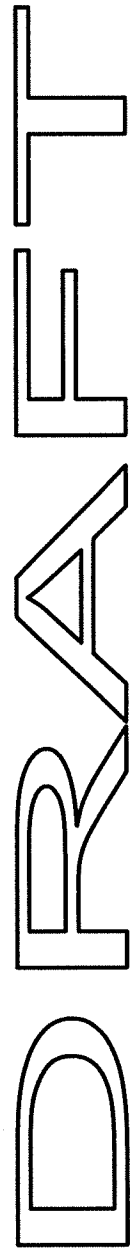
Number	Date	Pages

.6 Other documents, if any, listed below:

«None»

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)*



SECTION 00 6000
BONDS AND CERTIFICATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Attorney-in-fact who execute said bonds on behalf of a surety must affix thereto a certified and effectively dated copy of their Power of Appointment and Certification of an officer of the surety that the Power of Attorney continues in effect.

1.2 BID BOND:

A. A Bid Bond will be required for this project. The American Institute of Architects Document A310, February 2010 edition entitled "Bid Bond" shall be the contract bond form for this project. Each individual bid shall be accompanied by a check upon a duly authorized State, National Bank or Trust Company, duly certified in the sum equal to TEN (10%) percent of the total amount of the bid including alternates, or a Bid Bond in the amount of TEN (10%) of the bid, including alternates, payable to the Owner, and shall be enclosed in an envelope containing the bid; as a guarantee that the Bidder will, after the award is made to him, enter into a bona fide contract with the Owner for the work, and furnish the bonds and liability policies as required under the specifications. If, for any reason, whatsoever, the Bidder fails to enter into a proper contract and to execute the proper bonds, as required by these specifications, the amount of said guarantee be retained by the Owner shall be the difference 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.

1. Each bid bond must also be accompanied by the written consent of the Surety Company authorized to do business in the State of New York and be Best "Secured" rated or better.

B. All certified checks, except the check of the Bidder to whom a contract is awarded, will be returned to the respective Bidders, as soon as the Letter of Award has been issued by the Owner.

1. The check of the Bidder, to whom a contract has been awarded, shall be retained until the contract has been executed and all bonds together with an approved liability insurance policy are filed with the Owner.

1.3 PERFORMANCE AND PAYMENT BOND:

A. A Performance and Labor and Material Payment Bond will be required for this project. The bond premiums will be paid for by the Contractor.

B. The American Institute of Architects, AIA Document A312, 2010 edition, entitled “Performance Bond" and AIA Document A312, 2010 edition, entitled "Payment Bond" and shall be the contract bond form for this project. AIA Document A311 is not acceptable.

C. Each bond shall be a sum equal to One Hundred (100%) of the Contract Sum and shall be in a form satisfactory to the Owner, and shall be underwritten by a surety company authorized to do business in the State of New York.

D. Every Bond under this paragraph must display the Surety's Bond Number.

E. Each bond must be accompanied by an original Power of Attorney, giving the name of attorney's in fact and extent of bonding capacity.

F. The Surety Company shall be obligated for the bonds for a two year period after substantial completion.

G. All Surety Companies shall be permitted to do business in the State of New York and be A.M. Best Rating of "A" or better as to Policy Holder Ratings and "VII" or better as to Financial Size category.

H. A rider including the following provisions shall be attached to each Bond

1. Surety hereby agrees that it consents to and waives notice of any addition, alteration, omission, change or other modification of the Contract Documents. Such addition, alteration, change,

extension of time, or other modification of the Contract Documents, or a forbearance on the part of either the Owner or the Contractor to the other, shall not release the Surety of its obligations hereunder ad notice to the Surety of such matters is hereby waived.

2. Surety further agrees that in event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or Surety shall cause written notice of such default (specifying said default in detail) to be given to the Owner and the Owner shall have thirty (30) days from the time after receipt of such notice within which to cure such default, or such additional reasonable period of time as may be required if the nature of such default is such that it cannot be cured within thirty (30) days. Such Notice of Default shall be sent by certified or registered U.S. Mail, return receipt requested, first-class postage prepaid to Owner.
3. Surety agrees that it is obligated under the bonds to any successor, grantee or assignee of the Owner.

END OF SECTION

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR: **SURETY:**

OWNER:
Brewster Central School District
30 Farm to Market Road
Brewster, New York 10509

BOND AMOUNT: $

PROJECT:
C.V. Starr Intermediate School
Cafetorium Addition, Interior Renovation & Related Work

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.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as 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 necessary information and 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.

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

Signed and sealed this day of ,

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

AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

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

(Row deleted)
OWNER:

Brewster Central School District
30 Farm to Market Road
Brewster, New York 10509

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
C.V. Starr Intermediate School
Cafetorium Addition, Interior Renovation & Related Work

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: [ ] None [X] See Section 16

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

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as 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 necessary information and 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.

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

§ 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:

.1 Surety hereby agrees that it consents to and waives notice of any addition, alteration, omission, change or other modification of the Contract Documents. Such addition, alteration, change, extension of time, or other modification of the Contract Documents, or a forbearance on the part of either the Owner or the Contractor to the other, shall not release the Surety of its obligations hereunder ad notice to the Surety of such matters is hereby waived.

.2 Surety further agrees that in event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or Surety shall cause written notice of such default (specifying said default in detail) to be given to the Owner and the Owner shall have thirty (30) days from the time after receipt of such notice within which to cure such default, or such additional reasonable period of time as may be required if the nature of such default is such that it cannot be cured within thirty (30) days. Such Notice of Default shall be sent by certified or registered U.S. Mail, return receipt requested, first-class postage prepaid to Owner.

.3 Surety agrees that it is obligated under the bonds to any successor, grantee or assignee of the Owner

(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)

(Row deleted)
OWNER:

Brewster Central School District
30 Farm to Market Road
Brewster, New York 10509

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
C.V. Starr Intermediate School
Cafetorium Addition, Interior Renovation & Related Work

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: [ ] None [X] See Section 18

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

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as 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 necessary information and 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.

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

§ 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 When the claimant has satisfied the conditions of Paragraph 5 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 documents..

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to allow Contractor access to site to complete project in accordance with the contract schedule.

§ 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:

.1 Surety further agrees that in event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or Surety shall cause written notice of such default (specifying said default in detail) to be given to the Owner and the Owner shall have thirty (30) days from the time after receipt of such notice within which to cure such default, or such additional reasonable period of time as may be required if the nature of such default is such that it cannot be cured within thirty (30) days. Such Notice of Default shall be sent by certified or registered U.S. Mail, return receipt requested, first-class postage prepaid to Owner.

.2 Surety agrees that it is obligated under the bonds to any successor, grantee or assignee of the Owner

.3 Each material or equipment supplier or subcontractor shall provide a partial release of liens every 60 days or as otherwise agreed upon between Owner and Contractor.

(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 7200
GENERAL CONDITIONS

1.1 RELATED DOCUMENTS

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

1.2 FORM OF GENERAL CONDITIONS

A. AIA Document A232 - General Conditions of the Contract for Construction - Construction Management Edition, 2019, attached, is the General Conditions between the Owner and Contractor has been revised and all deletions and additions have been incorporated, and is hereby made a part of the specifications. All references to the General Conditions within these specifications shall mean "General Conditions of the Contract for Construction" the American Institute of Architects, A.I.A., Document A232, 2019 Edition, as revised.

1.3 RELATED REQUIREMENTS

A. Section 00 5200 - Agreement Form.

B. Section 01 4216 - Definitions.

END OF DOCUMENT

AIA® Document A232® – 2019

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

for the following PROJECT:

C.V. Starr Intermediate School
Cafetorium Addition, Interior Renovation & Related Work

THE CONSTRUCTION MANAGER:

Triton Construction Company, LLC
30 East 33rd St., 11th Floor
New York, New York 10016

THE OWNER:

Brewster Central School District
30 Farm to Market Road
Brewster, New York 10509

THE ARCHITECT:

Fuller and D'Angelo, P.C.
Architects and Planners
45 Knollwood Road
Elmsford, N.Y. 10523

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as 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 necessary information and 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.

Init.
/

TABLE OF ARTICLES

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, , sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals

§ 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. Any discrepancy between these General Provisions and the various sections of the specifications the General Provisions shall prevail.

§ 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 Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 In the event of conflict, ambiguity and/or unclear circumstances between any of the requirements of the Contract Documents, the requirement that is most inclusive of the highest quality and/or of the highest cost shall govern. The Contractor herewith agrees that no extra compensation shall be awarded to him, since he herewith received specific instructions to the procedure and values of the work.

§ 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 Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will establish the protocols for the development, use, transmission, and exchange of digital data. Neither the Owner, Architects or its agents are obligated to provide any available digital data or information to the contractor.

(Paragraphs deleted)

§

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative. Refer to Section 01 4216 for additional definitions.

(Paragraph deleted)

§ 2.1.2. In the event of conflict, ambiguity and/or unclear circumstances between any of the requirements of the Contract Documents, the requirement that is most inclusive of the highest quality and/or of the highest cost shall govern. The Contractor herewith agrees that no extra compensation shall be awarded to him, since he herewith received specific instructions to the procedure and values of the work.

§ 2.2 Information and Services Required of the Owner

§ 2.2.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for **the building permit**, necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. All other permits required from local agencies required for construction shall be paid for by the Contractor.

§ 2.2.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number. Refer to Section 01 4216 for additional definitions.

§ 2.2.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number. Refer to Section 01 4216 for additional definitions.

§ 2.2.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.2.5 The Owner shall provide surveys, if available, describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.2.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 2.3 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, 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.

(Paragraphs deleted)

§ 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 ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner, Construction Manager or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

(Paragraphs deleted)

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. Refer to Section 1.1.5

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 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. Refer to Section 1.1.6

§ 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.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the

purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ **3.2.3** The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ **3.2.4** If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, including architect's, engineer's, and attorney's fees subject to Section 15.1.7, 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 unless the Contractor recognized such error, inconsistency, omission or difference and knowingly failed to report it to the Architect and the Construction Manager.

§ **3.2.5** Except as to any reported errors, inconsistencies or omissions, and to concealed or unknown conditions defined in Paragraph 3.2.4, by executing the Agreement, the Contractor represents the following:

§ **3.2.5.1** The Contract Documents are sufficiently complete and detailed for the Contractor to (1) perform the work required to produce the results intended by the Contract Documents and (2) comply with all the requirements of the Contract Documents, within the time permitted for the completion of the work.

§ **3.2.5.2** The Work required by the Contract Documents, including, without limitation, all construction details, construction means, methods, procedures and techniques necessary to perform the work, use of materials, selection of equipment and requirements of product manufacturers will be consistent with: (1) good and sound practices within the construction industry; (2) generally prevailing and accepted industry standards applicable to Work; (3) 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.

§ **3.2.6** Building-In: Contractor(s) and sub-contractors shall note the parts and materials which must be built in as the work progresses, including but not limited to all templates, forms, sleeves, inserts, parts, blocks, anchors, etc. for all work throughout and shall furnish to or set for the Contractor for General Construction in time to prevent delay in the work. Contractors shall also comply with Section 01 7310 or Section 01 7000 Cutting and Patching.

§ 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 shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors, including Subcontractors of Subcontractor.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Contractor is solely responsible for managing labor and labor relations, including labor disputes or concerted activity, direct or indirect, without any delays or interference with the work schedule and/or other contractors at the site. No delay in the performance of the Work shall be excused by reason of labor problems affecting the Contractor or any subcontractor. In the event of strikes or labor disputes by other separate prime contractors, or other contractors performing work for the Owner under other Contracts, each contractor shall continue with its work and provide all necessary manpower as required to maintain the schedule and completion dates of the project.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect and Construction Manager in accordance with Section 3.12.8 or ordered by the Architect and Construction Manager in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive. Any request by the Contractor to make modifications to the work or substitutions shall not in any way cause or result in the delay of the ordering of any materials or equipment or the scheduling of the Work. Any such request shall require a minimum of **thirty days'** notice to the Owner and Architect and shall include full documentation of all costs and the time necessary. The full cost of any request by the Contractor for a modification or substitution, including but not limited to the cost of fees for the review of such request by the Owner, Construction Manager and Architect or legal counsel and any delay time, shall be borne by the Contractor. Refer to Section 01 2500 Substitution Procedures.

§ 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. Should any disorderly, incompetent, or objectionable person be hired or employed by a Contractor, upon or about the premises of the Owner, for any purpose or in any capacity, he shall upon the request of the Construction Manager or Architect, be discharged from the work, and not again be employed thereon without the written permission of the Construction Manager or Architect

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. In the event of a conflict between provisions of the contract documents, provisions providing for the longest warranty period shall apply.

§ 3.5.1.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.5.2 The warranties set forth herein shall survive termination of this Contract.

§3.5.2.1 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 a manner so as to preserve any and all such manufacturer's warranties.

§3.5.2.2 All new installations, assemblies, systems, equipment, and labor and materials installed by this Contractor shall be guaranteed against all defects and failures for a minimum period of 2 years from the date of final completion.

§3.5.2.3 For the above stated time periods from the date of final completion, the Contractor shall, at his own expense, promptly repair and put into first class condition any workmanship and materials in which defects may develop, and shall, at his own expense, promptly replace all defective equipment, apparatus, fixtures and materials, to the full satisfaction of the Owner.

§3.5.2.4 The date of final completion of all work shall be stated in writing by the Architect/Engineer and as acknowledged in writing by the Contractor.

§3.5.2.5 During the guarantee period, the Contractor shall be responsible for all costs, incurred in making the defective work good, both for labor and materials, and for all resulting injuries and damages to the building and to equipment.

§3.5.2.6 The guarantee provided by the Contractor is in addition to any warranty provided by equipment and material manufacturer. The Contractor's guarantee period shall not negate the longer guarantee period provided by equipment and material manufacturers.

§3.5.2.7 The Contractor warrants good title to all materials, supplies and equipment installed or incorporated in the work

§3.5.2.8 The Contractor for itself and its successors and assigns, warranties to the Owner and their successors and assigns:

a. The Warranty shall remain in effect for a period of time specified by appropriate Divisions of Specifications.
b. The Contractor will make good at its own cost and expense all defects and all damage caused to the Owner, in all Work and all trades required by the Contract Documents for Warranty Work. All corrections to defective Work shall be made at the convenience of the Owner

§ 3.5.2.9 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with and issuance of the Certificate of Substantial Completion.

§ 3.5.3 Refer to Section 01 7800 Closeout Submittal for additional requirements

§ 3.6 Taxes

§ 3.6.1 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.

§ 3.6.2 Each Contractor shall pay all applicable local, state, federal and other taxes and licenses

§ 3.6.3. The Owner is exempt from sales and use taxes for materials fully incorporated into the Work of the Contract as accepted and approved by the Architect. The Owner will take title to materials used in the Project in order to permit tax exemption. The Contractor shall pay all other sales, consumer, use and similar taxes incurred in connection with the Work provided by the Contractor. The Owner's exemption from sales and use tax does not apply to machinery, equipment, tools and other items purchased, leased, rented or acquired for the Contractor's use in part or entirely in connection with the Work. Upon request of the Owner or the Architect, the Contractor shall provide a bill of sale or other instrument indicating the quantities and types of materials purchased directly by the Contractor or Subcontractor for incorporation into the Work. Upon delivery of the materials to the Project sites, the Contractor shall mark or otherwise identify the materials to be incorporated into the Work. The Owner's tax exemption shall apply only to materials so identified and accepted.

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

§ 3.7.1 Unless otherwise provided paragraph in 3.6.1in the Contract Documents, the Contractor shall secure and pay for all other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. The Contractor shall pay any costs or fees incurred to comply with such requirements, any fines or penalties imposed for failing to comply and any costs or fees incurred by Owner due to any failure to comply. If the Contractor fails to give such notices, the Contractor shall be liable for and shall indemnify and hold harmless the Owner including its **Board of Education**, Architect, Construction Manager and their respective consultants, employees, officials, officers and agents against any resulting fines, penalties, judgements or damages, including reasonable attorney's fees imposed on or incurred by the parties indemnified hereunder.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work. The Contractor shall procure and obtain all bonds required of the Owner or by the municipality in which the project is located or by 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 back-up 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 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different 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, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2

(Paragraphs deleted)

Payments for Allowances and additional requirements Refer to Section 01 2100 for requirements.

(Paragraph deleted)

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The superintendent shall be at the site at all times when work is being performed and be fluent in English and be provided at all time with direct communications (cell phone) to all parties.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. including addresses and telephone numbers of the members of his organization who can be contacted in the event of an off-hours emergency at the building site. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules Refer to Section 01 3216 or 01 3000 for additional requirements

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors. Revisions to schedule shall be approved by the Owner. Comply with 3.10.3

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.2.1 All of the dates provided for in any of the schedules prepared by the Contractor and submitted to the Construction Manager and Architect, including all milestone and submittal dates, shall be considered to be "time of the essence" and may not be changed or modified without the Owner or Construction Manager's specific written approval.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work. All shop drawings are the product and property of the Contractor.

§ 3.12.1.2 Refer to Section 01 3000 Administrative Requirements for additional requirements.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting fully confirmed Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on

previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed New York State design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 The Contractor(s) shall have limited access to the site on the inside and outside of the building. Comply with other sections regarding limited access. The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents. Refer to Section 01 01731 or Section 01 1700 for additional requirements.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 Prior to occupancy the Owner must perform custodial cleaning of the work area. If the Contractor has not remove construction debris, equipment, tool etc which will prevent the Owner to perform custodial cleaning the Contractor will be back charged for additional cleaning costs incurred by the Owner.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 Indemnity Agreement - Compliance with the foregoing requirements as to insurance shall not relieve the contractor from liability under the indemnity agreement set forth in the general conditions as amended.

§ 3.18.1.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in the general conditions or supplementary general conditions.

§3.18.1.2 In the event that any party is requested but refuses to honor the indemnity obligations hereunder, then the party indemnifying shall in addition to other obligations, pay the cost to the party requesting indemnification or seeking enforcement and enforcing this indemnity requirement including, but not limited to attorney's fees.

§3.18.1.3 In addition, to the extent not covered above, the contractor or subcontractor shall defend, indemnify and hold harmless the Owner, Construction Manager, Architect, Architect's Consultants, and agents and employees of any of them, from any and all claims, losses, damages, suits, obligations, fines, penalties, costs, charges and expenses, which may be imposed or incurred by or asserted against any of them by reason of any act or omission of such contractor, or any subcontractor, or any person or firm directly or indirectly employed by such contractor with respect to violations of OSHA requirements, rules and/or regulations

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, Architect, and Contractor. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents and to perform such inspections and observations as are necessary to allow the Architect to review and approve change orders, claims of any kind and interim and general requisitions for payment, all in accordance with the applicable provisions of 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 promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

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

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be

through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Refer to Section 01 3000 for additional requirements.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.13.1 Neither the Construction Manager nor Architect may issue instructions to the Contractor to change the amount of the contract, except by properly executed Change Order.

§4.2.13.2 Instructions are issued by the Owner through the Construction Manager, to the Contractor. The instructions

shall not be carried out by the Contractor prior to a written order in the form of a change order, signed by the Owner, Construction Manager, Architect and Contractor, authorizing a change in the Contract amount or an adjustment to the Contract Sum.

§4.2.13.3 No amount shall be payable by the Owner to the Contractor for performance of work without an executed change order. Comply also Article 7.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith. Should the Architect's written interpretations, in the opinion of the Contractor, show additional work, or work of more expensive character than that shown or inferred by the Contract Drawings, it shall be the duty of the Contractor to so notify the Construction Manager and Architect within five (5) days from receipt of same in order that proper adjustment may be made if found justifiable in the opinion of the Construction Manager and Architect. The Contractor shall assume full responsibility for all such work done without the approval of the Owner, Construction Manager and the Architect.

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

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, within 10 days after award of the Contract, shall notify the Construction Manager, in writing, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection. Copies of all subcontractor contracts are to be provided to the Construction Manager.

§ 5.2.2 Each Contractor shall not award any work to any subcontractor or supplier without prior written approval of the Construction Manager and Architect. Approval will not be given until Contractor submits to the Construction Manager and Architect a written statement concerning the proposed award to the sub-contractor. The statement shall contain such information as the Construction Manager and Architect will require.

§ 5.2.3 If the Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Construction Manager and Architect have no reasonable objections. No increase in the Contract Price shall be allowed where a subcontractor is rejected by the Construction Manager or Architect or who is deemed unqualified to perform the particular work subcontracted by the Contractor or having too many current projects handled by insufficient personnel.

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

§ 5.2.5 Notwithstanding any other provisions of the Contract Documents, General Contractor shall perform at least twenty-five (25) % of the field work by its own employees.

.1 Prime/Sub Contractors for HVAC, Plumbing and Electrical shall perform at least seventy-five (75) % of the field work by its own employees.

.2 Roofing Contractors shall perform at least sixty-five (65) % of the field work by its own employees, including wood blocking, insulation, roofing, flashings, roof accessories, skylights and sheet metal work.

§ 5.2.5.1 For the purpose of the preceding paragraph, any part of the work performed by supervisory personnel (persons above level of foreman) or by the office personnel and such items as bonds, certificates, shop drawings and similar items shall not be considered part of the percentage of work required to be performed by the Contractor's employees.

§ 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 the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor

that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. The agreement between the Contractor and Subcontractor shall not provide, nor shall the Contract Documents be deemed to provide, any rights, remedies or redress by the Subcontractor(s) against the Owner.

(Paragraphs deleted)

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation. Should any Contractor sustain any damage or delay through any act or omission of any other Contractor having a contract with the Owner for the delivery and/or the installation of materials, supplies, equipment, plant, or appliances, or should the Contractor sustain any damage or delay through any act or omission of a subcontractor, the Contractor shall have no claim against the Owner or their Architects for such damage or delay, but shall have a right to recover or to claim such damage only from the other Contractor or subcontractor.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

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

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

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

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

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.2.6 Claims and other disputes and matters in question between the Contractor and a separate contractor shall be subject to the provisions of Article 15.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. Change Orders shall be submitted in total amounts for a particular change not in installments for each trade thereafter. All partial change order submissions will be rejected and returned to each Contractor for completion.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 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.
.4 In case where allowances as shown on the bid form and accepted by the Owner, they shall be used to determine the amount of addition to or deduction from the Contract Price. The unit prices or allowances when mutually agreed to be fair and equitable by Owner and Contractor will be made part of the Agreement.

§ 7.2.2 Final determination of all claims shall be by the Owner

§ 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.

§ 7.3.1.1 If the Construction Change Directive involves an adjustment to the contract price, the adjustment will be computed by the Architect in form conforming to 7.3.3.5.

§ 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;

.4 All additions and deductions to the Contract Price not covered by unit prices resulting from changes in the Work shall be determined by the following outline:

.5 CONTRACT WORK

a. Materials (Itemized Breakdown) _____

b. Rent of Equipment (Listed separately) _____

c. Sales Taxes (where applicable on Sub-Total #l) _____

d. Labor (Itemized Breakdown) _____

e. Insurance (Workmen's Compensation
Social security or as otherwise
required and/or specified) _____

Sub-Total #2 (items c, d & e) _____

f. Overhead & Profit (% x Sub-Total #2) _____
As per Article 7.3.

g. Sub-contract Work
(If applicable, in identical breakdown,
as shown above Sub-Total #1 & 2) _____

h. Contractor's overhead & profit
on sub-contract changes (5%) _____

Sub-Total #3 (items f, g & h) _____

i. **TOTAL QUOTATION (Sub totals 1, 2, 3)** _____

§ 7.3.3.1 Change Orders shall be submitted in total amounts for a particular change, not in installments for each trade thereafter. All partial change order submissions will be rejected and returned to the Contractor for completion.

.1 Overhead and profit combined, included in the total cost to the Owner, shall be based on the following schedule:

For the Contractor, for any Work performed by the Contractor's own forces, ten percent (10%) of the cost.

For the Contractor, for Work performed by Contractor's sub-contractor, five percent (5%) of the amount due the sub-contractor.

For each sub-contractor or sub-contractor involved, ten percent (10%) of the cost

.2 Cost to which overhead and profit is to be applied shall be limited to the following:

Labor.

Cost of Materials, including sales tax and cost of delivery.

Workers' or Workmen's Compensation Insurance.

Rental value of equipment and machinery.

§ 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.

§ 7.3.4.1 In order to facilitate checking of quotations for extras or credits, all proposals, shall be accompanied by a complete itemization of costs including labor, materials and sub-contracts. Labor and materials shall be itemized in the

manner prescribed above. Where major cost items are sub-contracts, they shall be itemized also. All change orders without such itemization will be returned to the Contractor for resubmission

§ 7.3.4.2
In order to facilitate checking of quotations for extras or credits, all proposals, shall be accompanied by a complete itemization of costs including labor, materials and sub-contracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are sub-contracts, they shall be itemized also. All change orders without such itemization will be returned to the Contractor for resubmission

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15. Failure to timely file any claim in accordance with the requirements set forth therein shall constitute a waiver of such claim.

§ 7.3.5.1 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.5.2 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 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.7 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.

§ 7.3.8 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.

(Paragraphs deleted)

§ 7.4 Minor Changes in the Work

§7.4.1 The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. The work included in such order shall be performed by the Contractor at no additional cost to the Owner and shall not form the basis for a claim for an extension of the Contractor's time to complete its Work. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time. The Contractor shall perform the work included in such orders so as to cause no delay to its Work and/or the work of other contractors engaged by the Owner in connection with the Project

§7.4.2 Minor Changes in the work are not to be construed as Change Orders. A signed minor change is not an approved change order.

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. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

§ 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.

§ 8.1.5 Dates indicated in Section 01 1000 Summary of Work or Section 01 11010 Milestone Schedule are dates critical to the Owner's operations that establish when a part of the work is to commence or be complete. All Milestone Dates are of the essence and shall have the same meaning as Substantial Completion for the purpose of Liquidated Damages in this Article 8. Liquidated damages applied to Substantial Completion shall apply to Milestone Dates.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; or (3) by other causes that the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Construction Manager may determine. No extension of time will be granted for changes in the work or labor disputes, or work stoppage due to asbestos removal. This paragraph shall control where a conflict appears among the contract documents.

§ 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 Paragraph 8.3.1, shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution or completion of the Work, (2) hindrance or obstruction in the performance of the work, (3) loss of productivity, or (4) other similar claims (collectively referred to in this Paragraph 8.3.3 as delays) whether or not such delays are foreseeable, unless a delay is caused by acts of the Owner constituting active 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 active interference with the Contract's performance of the work.

§ 8.4 DAMAGES

§ 8.4.1 Contractor realizes that time is of the essence on this Contract and the date of Substantial Completion shall be no later than the date set forth in Article 3.2 of the Contract. The Contractor understands that substantial disruption of

the school district's educational process will occur if the project is not completed by the date of substantial completion. In the event the Contractor fails to substantially complete the work under this contract by said scheduled date(s), the Contractor will be assessed Liquidated Damages the sum per calendar day, as follows:

Contracts having a value of $50,000 to $250,000	$500 per day
Contracts having a value of $250,001 to $5,000,000	$1,000 per day
Contracts having a value in excess of $5,000,000	$1,500.00 per day

and will, at the sole discretion of the Owner, be subtracted from the payment due the Contractor (or, if the amount due the Contractor as Payment is insufficient, any deficiency shall be paid by the Contractor to the Owner), except in cases where a delay is due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Government, in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, freight embargoes, or delays of Subcontractors or Suppliers due to such causes. Delay in acquisition of materials other than by reason of or freight embargoes will not constitute a delay excusable under this provision unless approved by the Owner in writing.

§8.4.2 Within five calendar days from the occurrence of any such delay, the Contractor shall notify the Construction Manager, in writing, of the cause of delay. The Construction Manager will ascertain the facts and extent of the delay, and extend the time for completing the Work when, in his judgment, the findings of fact justify such an extension. Construction Manager's findings of fact will be final.

§8.4.3 In addition to Liquidated Damages, the Contractor shall be liable for all additional costs incurred by the Owner due to the failure of the Contractor to complete each Phase as required. The additional costs shall include but not be limited to the following:
§8.4.3.1 Staff, as required, to make the facility accessible to the contractor; the Construction Manager, Architect and Consultants to perform inspections after the completion date of each phase.

§8.4. 3.2 The cost of additional inspections by the Architect and their consultants will be at the rate of $300.00 per hour per consultant.

§8.4.4 The said sum per calendar day and additional costs set out above, shall constitute the Liquidated Damages incurred by the Owner for each day of delay beyond the agreed upon dates of substantial completion. Such Liquidated Damages shall be in addition to any other damages (other than reason of delay) Owner may incur as a result of Contractor's breach of Contract, to include those which may be incurred pursuant to of the General Conditions.

§8.4.5 In addition to the liquidated damages described above, in the event the Contractor fails to complete all work under this Contract by said Scheduled Dates, the Contractor will, at the sole discretion of the Owner, not be permitted to perform any work during normal hours. Such work shall only be performed after hours, Saturdays, Sundays, holidays or periods when the school is unoccupied, at no additional cost to the Owner. This paragraph in no way limits any other rights, or remedies of the Owner under this Contract.

§8.4.6 All costs will be subtracted from payment due the Contractor (or, if the amount due the Contractor for payment is insufficient, any deficiency shall be paid by the Contractor to the Owner).

§8.4.7 This section shall in no way prevent the Owner from enforcing any other remedies it may be entitled to pursuant to the Contract, including the right of termination, and in the cases of termination, any damages suffered by the Owner shall not be considered damages by reason of delay, regardless of the reason for termination

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 Refer to Section 00 2000 Price and Payment Procedure for additional requirements.

§ 9.1.2 If Unit Cost Allowance prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted. Refer to Section 01 2100.

§ 9.1.3 Notwithstanding anything to the contrary contained in the Contract Documents, the Owner may withhold any payments to the Contractor if and for so long as the Contractor fails to perform any of its obligations or otherwise is in default under any of the Contract Documents; provided, however, that any such hold back shall be limited to an amount sufficient in the reasonable opinion of the Construction Manager to cure any such default or failure of performance by the Contractor.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. Refer to Section 01 2000 for Additional Requirements.. This schedule, unless objected to by the Construction Manager, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten 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. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 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.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and installed. If approved in advance by the Owner, payment may be made for materials and equipment suitably stored on site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such material and equipment or otherwise protect the Owner's interest, and shall include applicable insurance and storage. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Construction Manager 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 materials and equipment, including materials and equipment stored on-site but not installed, or stored in secured warehouse will require a bill of lading showing the exact value. upon which partial payments have been made shall become the property of the Owner, but the care and protection of such materials and equipment shall remain the responsibility of the Contractor until incorporation and approved into the Work, including maintaining insurance coverage on a replacement cost basis without voluntary deductible.
Notwithstanding payment by the Owner, all warranties and/or guarantees required by the Contract Documents shall not begin to run until the Contractor has completed its Work.

§ 9.3.2.2 In no case will more than 90% be approved if the item is not installed. Insurance certificates will be provided specific to materials stored (for on-site or offsite items).

§ 9.3.2.3 When Construction Manageer or Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment relating to the Work.

§ 9.3.4 Application for all Payments must be accompanied by certified payroll records and all releases of liens for previous applications **from Contractor and their subcontractors** and a sworn and notarized statement that all subcontractors have been paid to at least **95%** of previously requisitioned sums. In the event a lien is filed on the Owner's property, by any entity, due to the actions of the Contractor, regardless of the relationship between the lien and the work performed on this project all payments will be held in abeyance until such lien is bonded or removed.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within 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 (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of

the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor or other Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.
- **.8** failure to comply with scheduled milestone or submittal dates.
- **.9** damages resulting from the Contractor's failure to notify the Architect of errors or inconsistencies between and among the Contract Documents;
- **.10** failure of the Contractor and/or its Subcontractors to comply with the requirements for maintaining record drawings.
- **.11** the Construction Manager's or Architect's discovery or observation of work which has been previously paid for by the Owner which is defective and/or incomplete.
- **.12** such other acts and/or omissions by the Contractor in connection with the performance of its Work that do not comply with the Contract Documents; or
- **.13** the amount requested exceeds the percent completion of work on the Project site(s).

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 Refer to Section 01 2000 Price and Payment Procedures for additional requirements.

§ 9.6.1.1 Payment Period: Submit at intervals stipulated in the Agreement but not more than one per month.

§ 9.6.1.2 Form to be used: AIA G702 and AIA G703.

§ 9.6.1.3 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

(Paragraph deleted)

§ 9.7 Failure of Payment

§ 9.7.1 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 business 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 business 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 ten business additional days' notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received.

§ 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.

§ 9.8.1.1 Contractor shall advise Construction Manager and Architect of pending insurance changeover requirements.

§ 9.8.1.2 Contractor shall obtain and submit releases permitting Construction Manager and Architect unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases

§ 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, the value of items on the list, and reasons why the Work is not complete prior to final payment. The Contractor shall proceed promptly to complete and correct the items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion. **If the Architect,** assisted by the Construction Manager, **is required to inspect the Contractor's work more than twice, the Contractor shall be back charged for the cost of the Architect's and Construction Manager's services for the additional inspections.**

§ 9.8.3.1 Certificate of Substantial Completion will be issued only after completion of all punch list items or Construction Manager will notify Contractor of items, either punch list or additional items identified by Architect, that must be completed or corrected before a certificate will be issued. After completion of all punch list items submit the following to the Construction Manager:

- **.1** Application for Payment showing 100 percent completion for portion of the Work claimed as substantially completed.
- **.2** Manufacturer's Warranties/guarantees.
- **.3** Contractor's Warrantee **Two (2)** years minimum and extended warrantees.
- **.4** Maintenance agreements, if any.
- **.5** Manifest for disposal of Hazardous Material.
- **.6** Manifest for disposal of material.
- **.7** Test/adjust/balance reports and records.
- **.8** Maintenance Manuals and Instructions Manuals
- **.9** Signed Receipt by Owner's Representative of spare parts and attic stock.
- **.10** Meter readings
- **.11** Start-up performance reports.
- **.12** Changeover information related to Owner's occupancy, use, operation, and maintenance.
- **.13** Advice on shifting insurance coverage.
- **.14** Final progress photographs.
- **.15** List of incomplete Work, recognized as exceptions to Architect's "punch list".
- **.16** Removal of temporary facilities and services.
- **.17** Removal of surplus materials, rubbish and similar elements.
- **.18** As Built Drawings.
- **.19** Project Record Documents.
- **.20** DOL Final Completion Form. (PW 200).
- **.21** This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents. The Contractor understands that no retainage will be paid until all work, including punch lists, including photos showing completed items, are complete and submission of all close out documents as listed in Section 01 7800 Closeout Submittals are approved.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.1.1 If the Contractor's Work is not accepted by the Construction Manager and Architect after final inspection and additional time is required to complete items identified during the final inspection, the date starting the warranty

periods described in the Contract Documents shall be set by the Architect at his discretion, but no later than the date of the Final Certificate for Payment.

§ 9.10.1.2 If the Construction Manager and Architect are required to perform more than one final inspection because the Contractor's Work fails to comply with the requirements of the Contract Documents, the amount of compensation paid to the Architect by the Owner for additional services shall be deducted from the final payment to the Contractor

§ 9.10.2 Neither final payment nor any 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, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) completion of all "punch list" items, including photos. (6) submission of all closeout documents as listed in Section 01 7800 Closeout Submittals (7) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and, (8) Architect's punch list certifying all punch list items have been completed with each item signed off by the Owner's Representative and Contractor (9), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.2.1 It is understood by the Contractor that the maximum payment due the contractor prior to final payment shall be Ninety (95%) of the Contract amount and the final Five (5%) will be due only after the above is satisfied

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment may be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.
- **.5** defective work discovered after final payment concealed conditions.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.11 APPLICATIONS FOR PAYMENT WHEN BEHIND SCHEDULE

§ 9.11.1 When the project falls behind schedule the contractor shall demonstrate the actions to be taken to put the project back on schedule.

§ 9.11.1.1 Payments will not be approved until satisfactory evidence is presented to put the project on schedule

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. The Contractor shall make the participation of its Subcontractors in its safety plan and program mandatory. The Contractor and its Subcontractors shall conduct their operations in accordance with the Safety Guides for Construction issued by New York State Education Department ("SED") , DASNY and the Contractor's Safety Plan and Program.

§ 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, a Subcontractor, or a Sub-subcontractor;

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and

.4 construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.1.1 The Contractor shall maintain **at the project site** MSDS documentation for all material brought on site.

§ 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 including:

.1 The work on the project of any other contractors or any property of any other contractors work on the project;

.2 shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement during construction.

§ 10.2.2.1 Any and all fines or citations levied against the Owner, Construction Manager, Architect due to the failure of the Contractor to comply with statutes, ordinances, codes, rules, regulations, or lawful orders of any governing authority, shall be paid for by the Contractor. This shall include any interest or late charges which accrue due to the Contractor's failure to remit payment upon receipt of such levies.

§ 10.2.2.2 Any reference made to rules and regulations promulgated by various governmental agencies with the Specifications or Construction Drawings are for the Contractor's benefit. The issuance of compliance to said regulations by workers employed by the Contractor or by sub-contractors is the sole responsibility of the Contractor; and that, notwithstanding any reference to any rule or regulation, that the Construction Manager, Architect, the Architect's construction observer (Clerk-of-the-Works) or any representative of the Owner is not assuming any duty to provide supervision of construction methods in processes.

.1. Each Contractor shall assign one person from his staff to be on-site safety coordinator.

.2 Each Contractor is solely responsible for overall job site safety, the safety of his employees and the conduct of his work and that of his sub-contractors.

.3 Each Contractor affirms he is fully versed in all State, Federal and local regulations pertaining to safety including OSHA regulations, and pertaining to any and all construction operations

,4 All site personnel have appropriate Department of Labor certification

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.3.1 The Contractor shall be responsible for all costs incurred by the Owner caused by false security alarms and false fire alarms set off by the Contractor, its Subcontractors, employees, suppliers, officers, directors or servants.

§ 10.2.3.2 All safety equipment including but not limited to hard hats and other personal protective materials and equipment (masks, face shields, gloves, etc.) required for the Contractor to perform its work are to be supplied by the Contractor and/or its Subcontractors.

§ 10.2.3.4 The Contractor acknowledges that the Labor Law of the **State of New York**, and regulations adopted thereunder, place upon both the Owner and Contractor certain duties and that liability for failure to comply therewith is imposed on both the Owner and Contractor regardless of their respective fault. The Contractor hereby agrees that, as between the Owner and the Contractor, and to the extent permitted by law, the Contractor is solely responsible for compliance with all such laws and regulations imposed for the protection of persons performing the Contract. For additional indemnity obligations see Section 3.18 of these General Conditions.

§ 10.2.3.5 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work, as necessary, form injury by any cause.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.
§ 10.2.4.1 When use or storage of hazardous materials or equipment or unusual construction methods are necessary to promulgate the Work, the Contractor shall give the Construction Manager reasonable advance notice, and shall maintain on the site, a full set of safety instructions relating to all such materials.

§ 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, employees, agents, or representatives of any of the above or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents and for on-site safety. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Owner shall only be responsible to pay for the services of the laboratory if the material or substance reported by the Contractor is found to be hazardous. 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 Sum shall be increased by the amount of the Contractor's reasonable additional costs.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused in whole or in part by negligent acts or omissions of the Owner, anyone directly or indirectly employed by the Owner or anyone for whose acts the Owner may be liable.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

(Paragraph deleted)

§ 10.4 Emergencies

In an emergency "immediately" 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. The word "immediately", for the purposes of this paragraph shall mean a time period which is less than the time it would take to notify the Owner's Representative of the emergency.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds.

§ 11.1.1 All insurance purchased by Contractor shall constitute primary insurance and primary coverage for all risks insured and that any other liability insurance that Construction Manager and Fuller and D'Angelo, P.C. may procure or maintain is secondary and that there shall be no contribution by such insurance until insurance provided by the Contractor is exhausted. All policies shall be provided by insures licensed to conduct business in New York State.

§11.1.1.1 The following insurance coverages and requirements must be provided by the contractor and evidence of same must be certified to the Owner, Owner's Representative and Fuller & D'Angelo, P.C. prior to commencing any work under this **contract,** and original certificates of insurance, shall be furnished prior to the contract signing.

§ 11.1.1.2 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to conduct business in the jurisdiction in which the Project is located 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.

§11.1.2 Certificates of Insurance:

.1 Each certificate shall include the following clause: It is agreed that prior to any cancellation of, or material change in the policies certified to on this Certificate, 30 days written notice, by certified mail, return receipt requested, shall be sent to the Owner, Owner's Representative and Architect prior to the effective date of such change or cancellation.

.2 Shall specifically describe the work to be performed and the job site location.

.3 Shall include to the fullest extent permitted by law, the Contractor shall, defend, indemnify and hold harmless the Owner, Consstruction Manager, Architect, their respective Consultants and their respective members, directors, officers, agents, employees, successors, and assigns (collectively "Indemnitees") from and against any and all losses, claims, costs, damages, expenses, and attorneys' fees, arising out of or resulting from the performance of the Work, or by Contractor's breach of this Agreement, except to the extent caused by the sole negligence or willful misconduct of any Indemnitee hereunder.

.4 The Contractor and each of its Subcontractors and to all Shared Services Contracts (Purchase Order Agreements) shall include the Owner, Construction Manager, Architect and their Consultants as Additional Insureds on their casualty and commercial liability insurance policies on a primary and non-contributory basis, including a waiver of subrogation, acceptable to Owner, and shall not include any exclusions that limit the scope of coverage beyond that provided to the named insured and the endorsement shall not require a written agreement with the Additional Insureds.

.5 Additional Insured status shall be provided by ISO endorsement CG 20 38 04 13, CG 220 38 and CG 20 37. A completed copy of the endorsements must be attached to the Certificate of Insurance.

.6 A copy of the endorsement(s) providing additional insured sections must be attached to the Certificates.

.7 A fully completed New York Construction Certificate of Liability Insurance Addendum (ACORD 855 2014/15) must be included with the certificates of insurance. For any "Yes" answers on Items G through L on this Form– additional details must be provided in writing.

.8 Shall use the forms adopted and/or required by the **New York State** Workers' Compensation Board for proof of Workers' Compensation and **NYS** Disability Insurance, an ACORD certificate is not acceptable proof.

.9 Renewal Certificates of Insurance: Renewal Certificates of Insurance must be filed with the Owner, Construction Manager, Architect at least five (5) days prior to the expiration of any policy

§11.1.3 The Contractor acknowledges that failure to obtain such insurance on behalf of the Owner constitutes a material breach of contract and subjects it to liability for damages, indemnification and all other legal remedies available to the Owner. The Contractor is to provide the Owner with a Certificate of Insurance, evidencing the requirements have been met, prior to the commencement of the work or use of the facilities. Failure to provide said insurance shall cause the immediate suspension of all work and possible cancellation of this contract

§11.1.4 The Contractor agrees to carry as a minimum the following insurance in such form and with such insurers as are satisfactory to the Owner covering the work hereof:

.1 **Workmen's Compensation Insurance: Statutory Workmen's Compensation Insurance (C-105.2 or U-26.3) and NYS Disability Insurance (DB-120.1)** for all employees coverage as required by the State Law in which the project site is located, and in the state in which the Contractor is domicile, and licensed to do business, and for all of his employees to be engaged in work on the project under this contract, and in case such work is sublet, the Contractor shall require the subcontractor similarly to

provide Workmen's Compensation Insurance for all of the employees to be engaged in such work. Provide Statuary Limits and Coverages. Proof of coverage must be on the approved specific form, as required by **the New York State Workers' Compensation Board**. ACORD certificates are not acceptable.

.2 **Employers Liability Insurance**: Not less than $1,000,000 for all employees to be engaged in work on the Project.

.3 **Commercial General Liability Insurance** Including Premise/Operations, Independent Contractors, Products and Completed Operations, Broad Form Contractual, Broad Form Property Damage, Broad Form General Liability Endorsement and blanket coverage for underground hazards; X (explosion) C (collapse) U (underground).

Minimum Limits:

Each Occurrence:	$1,000,000.00
General & Product Liability Aggregate:	$2,000,000.00.
Products and Completed Operations	$2,000,000
Personal Injury:	$1,000,000.00.
Fire Damage Legal:	$50,000.00.
Medical Payment:	$10,000.00

(General Aggregate to apply on a per project basis).
Other Requirements: No Explosion, Underground, Collapse (XCU) exclusions.

.3 **Bodily injury** including death arising from any occurrence for the period and time for this specific work contract, including any contractual agreement assuming liability of Owner by terms of contract agreement in an amount of not less than the amount as stated above.

a. Coverage and limits required in no way restrict or relieve the Contractor from the full and complete responsibility for all injuries and/or damages and it is suggested that the Contractor consult their agent or broker to be certain their coverage, in form and limits, is sufficient for their needs.

.4 **Automobile Insurance**. Business Automobile liability insurance coverage format shall be as required by the state law in which any and all vehicles are registered, and must include all owned, hired or non-owned vehicle es in the following amounts:

Minimum limits:

Bodily Injury -	$1,000,000.00 each accident
Property Damage -	$1,000,000.00 each accident
or a combined single limit of	$1,000,000.00

.5 **Conditions of Coverage** Bodily Injury and Property Damage coverage under both General and Automobile Insurance shall include the "occurrence" basis wording. In the event of cancellation of insurance, the Owner shall be given advance notice of 30 days by the insured carrier and such to stipulated in the insurance contract.

.6 **Umbrella/Excess Liability Insurance.** Limit: $5,000,000.00 per occurrence and aggregate excess over Underlying Comprehensive General Liability, Automobile Liability, Employers Liability Policies.

.7 **Self-Insured Retention** $10,000.00 per occurrence.

.8 **Owner Contractor Protective Liability Insurance (OCP):** The Contractor shall purchase and maintain an Owner's Protective Liability policy naming the Owner, Owner's Representative, and Fuller & D'Angelo, P.C. as named insured.
The original and duplicate policy shall be filed with Owner and the policy shall remain in effect until the job is formally accepted by the Owner.

Limits of Liability for project up to 1,000,000.:	$1,000,000.00 each occurrence. $2,000,000.00 aggregate
Limits of Liability for project over 1,000,001:	$2,000,000.00 each occurrence $4,000,000.00 aggregate

.9 **Asbestos/Lead/Hazardous Materials Liability Insurance :** With coverage for the services rendered for the Owner, including, but not limited to removal, replacement enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs in addition to Insurance specified, The Contractor shall provide the following liability insurance:
Workman's Compensation: State: Statuary

Applicable Federal: (e.g., Longshoremen, harbor work, Work at or outside U.S. Boundaries): Statuary

Employer's Liability: $100,000

Said policy shall be endorsed to indicate that the term "Insured" shall include the Owner, Construction Manager, and Architects and be deemed to include their authorities, boards, bureaus, departments and officers thereof in their official capacities.

Said policy shall be endorsed to indicate that the Contractor is solely responsible for the premium cost of the policy including any audit adjustments.

Said policy shall contain a 30-day notice of cancellation clause with said notice to be sent to the Owner, Owner's Representative, and Architects by certified mail.

Minimum limits:

$2,000,000 per occurrence/$3,000,000, including products and completed operations. If a retroactive date is used, it must pre-date the inception of the contract

If automobiles are to be used for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage (ISO endorsement CA 9948) as well as proof of MCS 90:

.10 Builder's Risk: Unless otherwise provided for hereunder, the Contractor shall purchase and maintain throughout the course of the entire contract, and until final acceptance, a Builders Risk Policy providing a Builder's Risk Coverage Form or Builder's Risk Renovation Form in an amount equal to 100% of the construction replacement cost.
The coverage format shall be the "Special Coverage" form (all risk) **naming** the Owner, the Contractor and all subcontractors and suppliers as their interest appear. Loss, if any, shall be payable to the Owner as trustee for all interests. Contractor shall be solely responsible for the cost of any deductible.

.11 Flood and Earthquake Coverage: The Contractor, prior to commencing any work on the project, shall ascertain whether the site is subject to the perils of Flood, Mudslide and/or earthquake. If the exposure is present, the Contractor, prior to commencing any work on the project, at his sole cost expense, shall purchase and maintain coverage for the duration of the contract.
The Contractor shall provide to the Construction Manager, a written report and notice from a P.E. as to the Flood and Earthquake exposures at the site and indicate what coverage, if any is to be provided.

.12 Equipment, Tools and Supplies: By signing this contract, the Contractor agrees and understands that he is solely responsible for all loss to any tools, equipment, or supplies, owned, rented, or leased, stored at or off the site. Further, the Contractor certifies that he has provided or will provide notice to this effect to all subcontractors and suppliers.

.13 Testing **Company Errors and Omission Insurance:** $1,000,000 per occurrence/$2,000,000 aggregate for the testing and other professional acts of the Contractor performed under the Contract with the Owner.

.14 CYBER INSURANCE

(Paragraph deleted)
§11.1.5 Subcontractors Insurance: The Contractor agrees to provide all sub-contractors with a copy of these insurance requirements and further, agrees to require all subcontractors, manufacturers and suppliers to provide evidence of insurance of the same coverage and limits as are required from the Contractor pursuant to Section 11.1.1.4.

(Paragraph deleted)
§11.1.6 The Contractor shall maintain a separate record of each subcontractors' insurance certificates and said records shall be available for inspection by the Owner, Construction Manager and Architects for a period of 2 years from the date of final acceptance.

(Paragraph deleted)
§11.1.7 The Contractor shall not permit any subcontractors on the site until acceptable certificates of insurance have been filed and approved

§11.1.8 Waiver of Subrogation: All property insurance policies carried by the Contractor and his subcontractors shall contain a "Waiver of Subrogation" clause (including equipment floaters) to the effect that the Contractor agrees to waive all rights of subrogation against the Owner, Construction Manager and Architect.

§11.1.9 The signing of this contract acknowledges that the Contractors have notified their insurance carriers accordingly.

§11.1.10 Renewal Certificates of Insurance: Renewal Certificates of Insurance must be filed with the Owner, Construction Manager and Architect **at least** 30 days prior to the expiration of any policy

§11.1.11 Job Safety: The Contractor shall assign one person from his staff to be on the job site safety coordinator. The Contractor is solely responsible for overall job site safety, the safety of his employees and the conduct of his work and that of his subcontractors.

§11.1.11.1 The Contractor agrees to cooperate and comply in full of the insurance representatives of the Owner, Construction MAnager and Architect. with respect to any safety recommendations or requirements.

§11.1.11.2 The Contractor affirms he is fully versed in all State, Federal and local regulations pertaining to safety including OSHA and Department of Labor regulations, pertaining to his trade and construction operations.

§11.1.12 Products, Completed Operations: The Contractor is required to, and agrees to carry Products and Completed Operations coverage.

§11.1.13 Certificates of Insurance shall be filed to this effect, annually with the Owner, Construction Manager, Architect and the Contractor shall obtain and record like certificates from his subcontractors

§11.1.14 Insurance Carriers: All insurance carriers providing coverage on the project must be **licensed** to conduct business and issue the type of insurer the carrier is providing to the Contractor in the State in which the project is located, and in the State in which the Contractor is domicile. The companies must be **A. M. Best "Secured"** rated or better. This requirement applies to all subcontractors as well.

11.1.15 If at any time, any policy required herein shall be or become unsatisfactory to the Owner, as to form or substance, or if the issuing company shall be or become unsatisfactory, the Contractor, upon written notice from the Owner, shall promptly replace said unsatisfactory insurance.

§11.1.16 Failure to provide, maintain or deliver satisfactory insurance during this project, at the election of the Owner, the contract maybe declared suspended, discontinued, or terminated.

§11.1.17 Failure to provide and maintain proper insurance under this contract shall not relieve, nor be construed to conflict with or otherwise limit the contractual obligations of the Contractor

§11.1.18 In the event that any claims, or claims aggregate be in excess of the insured amounts, filed by reasons of any operations under this contract, the Owner, at its sole opinion, may withhold from payments due or to become due the Contractor amounts equal to the excess of such claims, until the Contractor has provided evidence of additional financial security covering such claims, in a form satisfactory to the Owner.

§11.1.19 All the policies of insurance referred to in this Article 11 shall be issued in the names of the Owner, Construction Manager, Architect, Contractor(s), and his subcontractors. Said policy shall be endorsed to indicate that the term "Insured" shall include the Owner, Construction Manager, Architect and be deemed to include their authorities, boards, bureaus, departments and officers thereof in their official capacities. In all cases regarding insurance referred to in these specifications, certificates shall be provided to the Owner, Construction Manager and Architect.

§11.1.19.1 In the event that any of the insurance coverage to be provided by the Contractor to the Owner, Construction Manager and Architect contains a deductible, or the insurance provided by the Owner, Construction Manager or Architect contains a deductible, the Contractor shall indemnify and hold the Owner, Construction MAnager and the Architect harmless from the payment of such deductible, for all claims arising from any acts or omissions of Contractor or Contractor's officers, directors, employees, Subcontractors, suppliers or any others engaged by

Contractor directly or indirectly to perform Contractor's Work on the Project, which deductible shall in all circumstances remain the sole obligation and expense of the Contractor.

§ 11.1.20 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located. Refer to Section 00 6000 Bonds and Certificates.

§ 11.1.21 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.22 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within ten (10) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner or Construction Manager shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

(Paragraphs deleted)

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor, Architect, and Construction Manager for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner 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 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner or Construction Manager may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum . If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. 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.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within two (2) years 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 any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The two (2)-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The two (2)-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2 except as to the corrective work performed and subject to the continued existence of any manufacturer's warranty, if applicable

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

§ 12.3.1 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 affected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

§ 13.1.1 This Contract shall be governed by and interpreted in accordance with the substantive laws of the State of **New York**, without recourse to principles of choice of law.

§ 13.1.1.2 The Contractor shall at all times observe and comply with all Federal, State and Local Laws, rules and regulations and all policies, rules, regulations and protocols of the Owner, in any manner affecting the Work and all such orders as exist at present and those which may be enacted in the future, by bodies or tribunals having jurisdiction or authority over the Work and the Contractor shall indemnify and save harmless the Owner and its Board of Education, Construction Manager, Architect, employees, officers, agents, or servants against any claim or liability arising from, or based on, a violation of any such law, ordinances, regulation, order or decree by the Contractor or the Contractor's officers, directors, employees, Subcontractors and suppliers.

§ 13.1.1.3. Historical lack of enforcement of any law, local or otherwise, shall not constitute a waiver of Contractor's responsibility for compliance with such law in a manner consistent with the Contract Documents unless and until the Contractor has received written consent for the waiver of such compliance from the Owner.

§ 13.1.2 The Contractor specifically agrees, as required by New York Labor Law, Sections 220, and 220-d, as amended, that:

.1 No laborer, workman or mechanic in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or any part of the Work contemplated by the Contract, shall be permitted or required to work more than eight hours in any one calendar day or more than five days in any one week, except in the emergencies set forth in the Labor Law.

.2 The wages paid for a legal day's work shall not be less than the prevailing rate of wages as defined by law.

.3 The minimum hourly rate of wages to be paid shall not be less than that stated in the Specifications, and any redetermination of the prevailing rate of wages after the Contract is approved shall be deemed to be incorporated therein by reference as of the effective date of redetermination and shall form a part of this Contract. The Labor Law provides that the Contract may be forfeited, and no sum paid for any work done thereunder on a second conviction for willfully paying less than:

(a) The stipulated wage scale as provided in Labor Law, Section 220, Subdivision 3, as amended; or

(b) The stipulated minimum hourly wage scale as provided in Labor Law, Section 220-d, as amended

§ 13.1.3 The Contractor specifically agrees, as required by the provisions of New York Labor Law Section 220-e, as amended, with respect to operations performed within the territorial limits of New York State, that:

.1 In hiring of employees for the performance of work under this Contract or any subcontract hereunder, or for the manufacture, sale or distribution of materials, equipment or supplies hereunder, no Contractor, Subcontractor nor any person acting on behalf of such Contractor or Subcontractor, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates.

.2 No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this Contract on account of race, creed, color, disability, sex or national origin.

.3 There may be deducted from the amount payable to the Contractor by the Owner under this Contract a penalty of fifty ($50.00) dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of this Section 13.1.3.

.4 The Contract may be cancelled or terminated and all monies due under the Contract forfeited for a second or any subsequent violation of the terms and conditions set forth in this Section 13.1.3.

§ 13.1.4 The Contractor shall comply with all the provisions of the Immigration Reform and Control Act of 1986 and regulations promulgated pursuant thereto and shall require its Subcontractors to comply with same. The Contractor shall and does hereby agree to fully indemnify, protect, defend, and hold harmless the Owner, Owner's Board of Education, Construction Manager, Architect, agents and employees from and against any penalties, fees, costs, liabilities, suits, claims, or expenses of any kind or nature, including reasonable attorney's fees, arising out of or resulting from any violation or alleged violation of the provisions of said laws by Contractor or its Subcontractor(s) in connection with the Work of the Contract Documents.

§ 13.1.5 The Contractor shall maintain policies of employment as follows:

.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of age, creed, race, religion, color, sex, national origin, sexual orientation, gender identify or expression, military status, disability, predisposing genetic characteristics, familial status, marital status or status as a victim of domestic violence. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their age, race, creed, religion color, sex, national origin, sexual orientation, gender identify or expression, military status, disability, predisposing genetic characteristics, familial status, marital status or status as a victim of domestic violence. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to age, creed, race, religion, color, sex, national origin, sexual orientation, gender identify or expression, military status, disability, predisposing genetic characteristics, familial status, marital status or status as a victim of domestic violence.

§ 13.1.6 Dust Hazards - The Contract shall be void if the Contractor fails to install, maintain, and effectively operate appliances and methods for the elimination of harmful dust when a harmful dust shall have been identified in accordance with Section 222-a of the Labor Law of the State of New York.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.3.3 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.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Refer to Section 01 4000 Quality Requirements for additional requirements.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor, and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest Payments due and unpaid under the Contract Documents shall not bear interest. .

§ 13.6 TIME LIMITS ON CLAIMS

§ 13.6.1 The Owner and 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,

13.7 LIENS

13.7.1 If the Contractor or any of its subcontractors or suppliers should cause a Mechanic's Lien to be placed upon the property, then the Contractor shall be liable for any and all legal or bonding or insurance fees related to the removal of the Mechanic's Lien or the defense of any Mechanic's Lien enforcement or foreclosure proceeding. Such legal or bonding or insurance fees shall also be a deduction by the Owner from any moneys due or to become due to the Contractor.

§ 13.8 SEXUAL HARASSMENT PROHIBITED

§ 13.8.1 Federal and state laws and the policies of the Owner prohibit sexual harassment of employees. Sexual harassment includes any unwelcome sexual advances, requests for sexual favors or other verbal or physical conduct of a sexual nature that create a hostile or offensive working environment for students, employees and volunteers of the Owner and employees, agents, consultants, suppliers, subcontractors and others engaged directly or indirectly by Contractor to perform work on the Projects. The Contractor shall exercise control over its employees, agents, consultants, subcontractors, and suppliers so as to prohibit acts of sexual harassment of students, employees and volunteers of the Owner. In the event the Owner, in its reasonable judgment, determines that the Contractor or its employees, agents, consultants, subcontractors and/or suppliers have committed an act of sexual harassment, upon notice from the Owner, the Contractor shall cause such person to be removed and shall take such other action as may be reasonably necessary to cause such sexual harassment to cease. In the event the Contractor or its employees, agents, Subcontractors or suppliers believes it has been the subject of sexual harassment by the Owner, its elected and appointed officials, students, volunteers, vendors, employees or agents, it shall give notice to the Owner; so, the Owner can take such action as may be reasonably necessary to cause any sexual harassment to cease.

§ 13.9 GENERAL PROVISIONS

§ 13.9.1 Contraactor agrees to do all acts and things and to make, execute and deliver such written instruments, as shall from time be reasonably required to carry out the terms and provisions of the Contract Documents.

§ 13.9.2 Contractor is obligated, by virtue of entering into a contract with the Owner, to ensure that absolutely no asbestos containing material is used in conjunction with the Work. It is the Contractor's sole responsibility to provide assurance that no asbestos containing material is built into the construction, nor does any equipment used in the construction contain any asbestos containing material. If asbestos containing material is found, at any time during or after the construction is completed, it shall be the responsibility of the Contractor who installed said material to remove it and replace it with new non-asbestos containing material, as per federal, state and local mandates, and to indemnify all their employees, agents, or servants or any third parties including but not limited to the Owner and the Architect, and their respective servants or employees for any costs or damages incurred on account of personal injury or death or property damage caused by, arising out of, or in any way incidental to, or in connection with the performance of the Work hereunder. This provision will be limited only to the extent required by law and shall survive the termination or expiration of the Contract. Refer to Section 01 7800 Closeout Submitials for additional requirements.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

(Paragraph deleted)

§ 14.1.2 If one of the reasons described in Section 14.1.1 exists, the Contractor may, upon seven days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

(Paragraphs deleted)

§ 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 or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.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** If the Contractor fails to satisfy or bond any filed liens against the Owner in the Performance of his contract.
- **.6** disregards the instructions of the Construction Manager, Architect or the Owner (when such instructions are based on the requirements of the Contract Documents);
- **.7** breaches any warranty made by the Contractor under or pursuant to the Contract Documents.
- **.8** 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.
- **.9** 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.
- **.10** fails or neglects to prosecute the Work in such a manner to reasonably assure completion within the contract time;
- **.11** fails to keep the Project free from strikes, work stoppages, slowdowns, lockouts or other disruptive activity;

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, three days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished and the Contractor is back charged for all costs incurred by the Owner.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.2.5 The Owner may take over the work for one of the reasons stated in sub-paragraph 14.2.1 after giving the Contractor and the Contractor's Surety, if any, three days' written notice. The Contractor will be back charged for costs incurred by the Owner.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts, and purchase orders and enter into no further subcontracts and purchase orders.

.4 proceed to complete the performance of the remaining Work on the Contract which has not been so terminated

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, and any deposits or down payments which the Contractor has made pursuant to the Agreement which cannot, in the exercise of good faith and due diligence by the Contractor, be refunded or applied as a credit in the Contractor's favor to other charges, provided, however, that if such deposits or down payments are not refundable, Contractor shall assign the applicable contract, agreement, purchase order, etc. to the Owner who, at its election, may require performance of same. The Contractor hereby waives and forfeits all other Claims for payment and damages, including, without limitation, overhead and profit related to Work terminated by the Owner pursuant to this Section 14.4.

§ 14.4.4 In case of a termination pursuant to this Section 14.4, the Owner will issue a Construction Change Directive or authorize a Change Order, making any required adjustment to the Date of Substantial Completion and/or the sum of Contract monies remaining to be paid to the Contractor. The Owner shall be credited for (1) payments previously made to the Contractor for the terminated portion of the Work, (2) Claims which the Owner has against the Contractor under the Contract, and (3) the value of the materials, supplies, equipment or other items that are to be disposed of by the Contractor that are part of the Contract Sum; multiplied by 15% representing the Contractor's overhead and profit.

§ 14.4.5 For the remaining portions of the Contractor's Work which have not been terminated pursuant to this Section 14.4, the terms and conditions of the Contract with the Owner shall remain in full force and effect. The Contractor shall continue to prosecute that portion of its Work that was not terminated pursuant to this Section 14.4.

§ 14.5 Limitation of Owner's Liability

§ 14.5.1 The Owner shall not be responsible for damages or for loss of anticipated profits on Work not performed on account of any termination of the Contractor by it.

§ 14.5.2 The Owner shall not be liable to the Contractor for punitive damages on account of any termination of the Contractor and the Contractor hereby expressly waives its right to claim such damages against the Owner.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents. As is set forth in other provisions of this Contract, delay in the Contractor's ability to complete the work

may, in appropriate circumstances, give rise to a claim for additional time, but will under no circumstances be the basis of a claim for damages.

§ 15.1.2 Time Limits on Claims. The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages. The timelines provided herein for the making of claims shall be a condition precedent to any payment for such claims or the granting of any extension of time. Failure of the Contractor to comply with the time and notice provisions of this Article shall be an absolute bar to making any payment to or extending the time of the Contractor for such claim. All claims of any type seeking any monies, or an extension of time shall be accompanied by full documentation. A claim submittal without full documentation shall be rejected by the Construction Manager and Architect and, if not timely resubmitted within the original claim period, shall be waived. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Construction Manager will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. A decision by the Construction Manager shall be required as a condition precedent to **the Owner making any payment or granting any extension of time on any** claims between the Contractor and Owner arising prior to the date final payment is due Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both.

§ 15.2.6 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.

(Paragraph deleted)

§ 15.2.7 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.

(Paragraph deleted)

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, shall be subject to non-binding mediation

§ 15.3.2 The parties agree that claims, disputes or other matters in question between the parties to this Agreement, arising out of or relating to this Agreement or the breach thereof shall, before the commencement of litigation or a party availing itself of self-help remedies, be submitted to a third party neutral Mediator agreed to by both parties or, if

the parties cannot agree, appointed by the American Arbitration Association, at a non-binding Mediation that shall not exceed one calendar day. The parties may be represented by counsel at the Mediation, but no party may engage the Mediator as its representative after the Mediation. Statements made and documents provided or exchanged as part of the Mediation shall be for settlement purposes only and subject the applicable rules or regulations that govern such matters. All mediation shall take place within 30 days of any demand for same of and cost shall be shared by both parties.

(Paragraphs deleted)

§ 15.4 Arbitration

§ 15.4.1 The Contractor and the Owner shall not be obligated to resolve any claim or dispute related to the contract by arbitration; any reference to mediation or arbitration in the Contract Documents is deemed void. If a discrepancy is found in the Contract Documents, this paragraph shall be considered the final say.

(Paragraphs deleted)

ARTICLE 16 - NO DAMAGES FOR DELAY

§16.1 Notwithstanding any other terms or conditions set forth in the contract documents, general or supplementary conditions, the contractor agrees to make no claim for damages for delay in the performance of the work occasioned by any act or omission of the owner or any of its representatives, and agrees that any such claim shall be fully compensated for by an extension of time to complete the work, unless a delay is caused by acts of the Owner constituting active 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.

§16.2 Contractor agrees and acknowledges that payment for the work may have been obtained through obligations or bonds which have been sold after public referendum. In the event the work is suspended or canceled as a result of the order of any court, agency, department entity or individual having jurisdiction, or in the event the work is suspended or canceled due to the fact that a court, agency, department, entity or individual having jurisdiction has issued an order, the result of which is that the afore said obligations or bonds are no longer available for payment for the work, contractor expressly agrees that it shall be solely entitled to payment for work accomplished until a notice of suspension or cancellation is served upon the Contractor. Contractor expressly waives any and all rights to institute an action, claim, and cause of action or similar for any damages it may suffer as a result of the suspension or cancellation of the work and/or its contract pursuant to this section."

SECTION 00 7310
SPECIAL PROVISIONS

PART 1 GENERAL

1.1 SUMMARY

A. These Special Provisions are in addition to the Plans, Specifications, and the other Contract Documents and shall be part of this Agreement. In cases of contradictions, the most stringent Provision shall govern.

1.2 RELATED SECTIONS

A. Section 01 4216 - Definitions.

1.3 SPECIAL PROVISIONS

A. GENERAL REQUIREMENTS

1. Refer to AIA 232 General Conditions Article 11 for Insurance requirements. All contractors are to provide in addition to the ACORD Form, an executed ISO Endorsement CG 20 38 04 13 (or an equivalent form not requiring a written contract between the insured and additional insureds) naming The Owner, The Construction Manager and the Architect as additional insureds.
2. Each Prime Contractor shall provide a full time on site Superintendent or foreman whenever/wherever work is in progress.
3. Each Prime is to provide to the Construction Manager with a list of key personnel (site superintendents and principals) with addresses, telephone and cell numbers for emergency (twenty-four hour) purposes.
4. Each Prime Contractors is to provide to the Construction Manager a list of subcontractors, sub-subcontractors suppliers and vendors with names, addresses, telephone numbers and description of work they shall perform or furnish.
5. Provide one (1) week after Notice to Proceed, a cash flow projection for the entire project.
6. Each Prime Contractor to supply, and each employee is to wear, formal ID cards when working on site. Refer to Section 01 3553.
7. All Contractors shall submit their safety plan and corporate safety policy one (1) week after Notice of Award. Plan must meet OSHA standards. Owner to receive a copy of each Prime Contractor's safety meeting minutes to be held at least once a week. A person signaling movements at all locations shall control movement of trucks and other construction equipment by flags as required or directed by the Construction Manager.
8. One (1) week after Notice of Award, all Prime Contractors are to submit a "Site Safety and Logistics Plan". Indicate in this plan delivery/removals access and traffic plan, refuse container location, crane/picker/lifts location(s), temp rated plywood/GWB painted partitions separating construction and work areas, staging and storage areas. Construction staging areas shall be as indicated on drawing or as required for proper separation of the work. Each Contractor shall be allowed to have only one (1) office trailer if approved by the Construction Manager.
9. Mandatory Owner, Construction Manager, and Prime Contractor coordination meetings will be held once a week, unless specified otherwise. All Prime Contractors are required to attend.
10. Each Prime is responsible for his own storage space at site. Each Contractor will be required to supply and insure storage for their own materials. All costs related to delivery, construction, protection, power, etc. are borne by the individual Contractors utilizing the space.
11. All Contractors shall have a representative on site to accept deliveries of equipment and supplies. Deliveries arriving on site without a Contractor present to accept it, will be turned away. Owner and Construction Manager will not sign delivery tickets.
12. Contractors are to submit Daily Construction Reports to the Construction Manager, detailing manpower and work activities on site. In addition, the Contractors are to submit Two (2) Week Look Ahead Schedules for upcoming work. Refer to Section 01 3000
13. A schedule of projected fabrication and delivery of long lead items shall be submitted one (1) week after the Notice to Proceed.

14. Progress/Status reports on fabrication and delivery are to be submitted to the Construction Manager every two (2) weeks. A 'Rate of Change' chart and marked-up shop drawings are to be included in these reports.
15. Disconnect / Tie-In work involving ANY utilities that would interfere with the ongoing operations of the building shall be completed after-hours, weekends, holidays when approved by the Construction Manager. Utilities are to be restored prior to the opening of the building on the following day with adequate time for the Owner to prepare the building for normal operations. The Construction Manager is to be notified at least 48 hours in advance.
16. Requests for Information (RFI) are for requests on clarifications or questions on the Contract Drawings and Specifications, not contract terms, scheduling items, or general correspondence, or as a means to describe or request approval of alternate construction means, methods or concepts, substitution or materials, systems means and methods. Each Contractor shall send each RFI (electronically) directly to the Architect and Construction Manager's office concurrently. On the 'date required' section, fill in the exact date the information is needed, not ASAP or immediately. Each Contractor will be responsible to generate an RFI log and update it weekly. Based upon the amount of RFI's received and their level of content, the Architect/Engineer shall establish the level of importance of RFI's and shall be allowed sufficient time, in the Architect/Engineer's professional judgement, to permit adequate review.
17. Except for the basic building permit, the Prime Contractor's bid price shall include all fees and other costs for securing and maintaining (by the Prime Contractors or their subcontractors) for the duration of the project; all permits, PE licenses, connection fees (Gas, Electric, Health Department, Water District or other utilities and services), inspections, etc., applicable to, or customarily secured for the Work.
18. Smoking and alcoholic beverages are expressly prohibited on all of the Owner's properties. All Contractors, Subcontractors and suppliers shall wear photo identification, shirts, long pants and other proper attire while on the Owner's site. All persons representing contractors, subcontractors or suppliers shall conduct themselves in a manner consistent with the rules and policies of the Owner and the governing agency at all times.
19. The Prime Contractors and their subcontractors are to provide their own personal protection equipment while performing any work.
20. The Prime Contractors shall be responsible for any loss or damage to their property, operations and partially or fully completed work. The Prime Contractor will also maintain every precaution to prevent damage to the work of other Prime Contractors and sub contractors during the course of construction. Damage to work of other Prime Contractors and subcontractors will be charged to the offending party(s).
21. The Electrical Prime Contractor shall provide temporary electric light and power services; typical OSHA an NEC approved temporary light and power services within all the construction areas. All equipment connections and extensions shall be by all the other Prime Contractors.
22. All contractors are to take precautions at all times during the progress of the work to prevent water and debris from entering the buildings due to conditions caused by their construction operations.
23. Contractor is responsible to mobilize immediately on-site to correct any such infiltration and provide clean-up and restoration. Any costs due to damages will be borne by the responsible Prime contractor. Failure to respond in a timely manner will result in a back charge to the contractor for time and expenses of the Owner, Owner's representative , Architect/Engineer, and Construction Manager related to their response to the event.
24. Notwithstanding anything to the contrary contained herein or in the Contract Documents, with respect to each Prime Contractors' or Trade Contractors' own work, the Owner, Architect/Engineer, and Construction Manager shall not have control over or charge of the work and Owner, Architect/Engineer, and Construction Manager shall not be responsible for construction means, methods, techniques, sequences or procedures, and/or for safety and safety precautions and programs in connection with the work of each of the Prime Contractors or trade

contractors, since these are solely the Contractor's and trade contractor's responsibility. The Architect/Engineer and Construction Manager shall not have control over or charge of acts or omissions of the Prime Contractors, Trade Contractors, subcontractors, or their agents or employees, or any other persons performing portions of the work not directly employed by the Owner, Architect/Engineer, and Construction Manager.

B. COORDINATION

1. Each Prime Contractor shall generate a complete "Submittal Log" within one (1) calendar week of the Notice to Proceed. This log is to list all required submittals specific to their trade, as detailed in the Project Manual/Specs.
2. Each Prime Contractor is responsible to review and stamp all shop drawings reviewed, prior to submission to the Owner, Architect/Engineer, and Construction Manager. The Architect/Engineer will not review any shop drawings unless first reviewed by the respective Contractor.
3. Submittals must be submitted by each Contractor with a transmittal letter.
4. All submittals that do not meet the above requirements will be immediately returned with no Owner extension of time for the required submittal.
5. Each Prime Contractor will be responsible for distribution of their approved drawings/cuts, in a timely manner, to other Prime Contractors and Sub Contractors, for coordination with their work. Any additional cost generated due to lack of transfer of information will be borne by the Contractor responsible for distribution. In the event the Prime Contractor fails to distribute shop drawings / product information to other Prime Contractors, the Owner reserves the right to have the Architect make the necessary copies and ship via overnight delivery to the parties involved. All costs incurred will be backcharged to the Prime Contractor responsible for not distributing shop drawings / product information. Each Prime Contractor is responsible for coordinating their work with all other Prime Contractors. No additional cost requests will be considered due to lack of coordination between the Prime Contractors.
6. Review 01 3000 for additional requirements.
7. Each Prime Contractor shall be responsible for all cutting, fitting and patching as required to perform their work in accordance with the Contract Documents and project schedule. In the event that others will perform cutting, fitting and patching, these costs shall be charged to the Prime Contractor responsible for the work. Refer to Section 01 7310.
8. The Prime Contractor is advised to exert utmost care and diligence when working in or near any existing buildings or sitework that is to remain. The absence of protection around such items shall not excuse the Prime Contractor from their liability to provide protection. Any damages to the existing buildings, site work or facilities shall be repaired and expended to the responsible Prime Contractor.

C. MILESTONE DATES -

1. Three (3) weeks after notice to proceed the General Contractor or Lead Prime Contractor, as determined by the Architect and Construction Manager, shall submit a detailed schedule for review / approval by the Architect and Construction Manager. The Prime Contractor shall include all milestones and long lead items on the schedule. One (1) week after receipt of the preliminary schedule all other Prime Contractors are required to review and comment on the schedule. Upon receipt of all comments, the Prime Contractor responsible for producing the schedule, shall incorporate all changes and distribute copies to all Primes, Architect and Construction Manager.
2. Failure to meet intermediate milestone dates will jeopardize the overall Project Schedule and will require the Contractor(s) to work overtime at the cost of those Contractor(s) responsible for such delays. In addition, all costs due to delays in completion of the work which require additional Construction Management, Architect, Owner services beyond the work duration in Project Bid Schedule shall be borne by Contractor(s) responsible for delays as per General Conditions of the contract for construction.
3. The Contractor acknowledges that time is of the essence and shall supply substantial manpower as required to meet the milestone dates. The Owner reserves the right to carry out work or augment

labor force as required when, by the Owner's judgment; it becomes apparent that milestone dates may not be met

D. SITE ACCESS AND CONTROL

1. The construction personnel shall park in designated locations only.
2. All construction personnel shall wear photo identification badges while on site. The badges shall include a color picture of the employee, employees name, company name and project name.
3. The Prime Contractors, subcontractors and suppliers shall not place signage on any portion of the Project or on any property surrounding the Project.
4. The Prime Contractor is solely responsible for the protection of its own material, equipment, tools and personal belongings while these items are on the premises.
5. The Prime Contractor shall be responsible for securing appropriate space for storing their material on site in apprpriate trailer/storage containers. Should insufficient space be available on site the Prime Contractor shall store its material off site, any costs associated will be the responsibility of the Prime Contractor. The Owner or the Construction Manager shall designate all locations for use by the Prime Contractors.

E. TEST/INSPECTIONS

1. If the Architect or Owner determines that in addition to what is specified elsewhere in project manual, any work which requires special inspection, testing or approval, the Construction Manager will instruct the Prime Contractor of such special inspection or testing. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Prime Contractor shall bear all costs thereof, including compensation for the Architect, Construction Manager, and Testing Lab.
2. Contractor shall furnish incidental labor to:
   a. Provide access to the work to be tested, sampled, and inspected.
   b. Obtain and handle samples at the project site or at the source of the product to be tested.
   c. Facilitate inspections, samplings, and tests.
   d. Coordinate with the Owner's Representative and testing lab, and submit schedule of required tests one (1) week in advance.
   e. Coordinate inspections with the testing laboratory.
3. The Prime Contractor shall coordinate independent testing and inspections. If any Prime fails to coordinate such inspections and additional costs are incurred to the Owner, the Prime will be responsible for that inspection cost. Architect and Construction Manager shall be notified 48 hours prior to the need of testing. In the event the Contractor does not give proper notification and the work is done with no test, that Contractor will bear all costs for subsequent testing of installed materials.
4. NOTE: All testing costs will be paid for by the Owner, except as noted above.

F. SCHEDULE OF VALUES

1. Within one (1) week after Notice to Proceed, the Prime Contractors shall submit a detailed billing breakdown on AIA G732 form for approval by the Construction Manager. No payments will be made until such billing breakdown is approved.
2. The Schedule of Values will be reviewed and adjusted if necessary. Once approved, the Schedule of Values is to be used for the AIA payment application.
3. Refer to Section 01 2000.
4. NOTE: Punch List value will be dispersed only when the work has been confirmed to be completed 100%
   a. The Owner will not reduce or pay any retainage until all work is complete including punch list.

G. PUNCH LIST

1. Upon substantial completion, the Prime Contractors are to submit to the Architect and Construction Manager a letter declaring that the work is substantially complete. Included with the letter is to be the Contractor's Punch List. Upon the receipt of above, the Construction Manager will schedule with the Owner, Architect, and Contractor, a walk-through to develop a single final Punch List two (2) days after receipt of letter. This single final Punch List agreed by all parties shall serve as the only Punch List. Upon failure to complete the final Punch List within two (2) weeks from receipt, the Owner reserves the right to complete same and backcharge the costs of material, labor, supervision, and other incidental costs to the Contractor.

H. HOURS OF WORK

1. All Prime Contractors must observe any required dates and times when no work activity will be allowed on-site due to the Owner's request and activities that take place in the building. Dates and times will be provided as soon as possible during the course of the project; however, no claim will be entertained for short notice to the Contractors for limiting or prohibiting the temporary suspension of construction activities.

1.4 LETTERS OF AGREEMENT

A. The following letters shall be acknowledged and executed by each Prime contractor upon award of a contractor:

Triton Construction

1279 Route 300, 1st Floor

Newburgh, New York 12550

_____, 20__

Contractor Name and Address:_____

_____

Name of Project: _____

Dear Sir/Madam:

Reference is made to your contract ("Contract") with the Brewster CSD ("Owner") for the above referenced Project. By signing below, you hereby acknowledge and agree, that for valuable consideration, the receipt of which is acknowledged, you covenant and agree that Triton Construction shall be added as an "additional insured" to your casualty and commercial liability insurance policies required under the Contract, including all primary and excess policies, limits, and terms and conditions contained therein, and further agree that an insurance certificate and endorsement confirming that this entity was added as an "additional insured" on such policies of insurance shall be provided by you prior to the commencement of work on the Project.

In addition, you further covenant and agree to hold harmless, indemnify and defend Triton Construction, to the same extent that you are required to hold harmless, indemnify and defend the Owner under the Contract.

Please acknowledge your consent by signing your name below.

Very truly yours,

Acknowledged and Agreed to by:

_____, as Contractor

By: _____

Name: _____

Title: _____

FULLER AND D'ANGELO, P.C.
ARCHITECTS AND PLANNERS
45 KNOLLWOOD ROAD SUITE 400
ELMSFORD, NY 10523

_____, 20__

Contractor Name and Address:_____

_____

Name of Project: _____

Dear Sir/Madam:

Reference is made to your contract ("Contract") with the Brewster CSD ("Owner") for the above referenced Project. By signing below, you hereby acknowledge and agree, that for valuable consideration, the receipt of which is acknowledged, you covenant and agree that Fuller and D'Angelo, P.C. Architects and Planners shall be added as an "additional insured" to your casualty and commercial liability insurance policies required under the Contract, including all primary and excess policies, limits, and terms and conditions contained therein, and further agree that an insurance certificate and endorsement confirming that this entity was added as an "additional insured" on such policies of insurance shall be provided by you prior to the commencement of work on the Project.

In addition, you further covenant and agree to hold harmless, indemnify and defend Fuller and D'Angelo, P.C. Architects and Planners to the same extent that you are required to hold harmless, indemnify and defend the Owner under the Contract.

Please acknowledge your consent by signing your name below.

Very truly yours,
Joseph Fuller, Jr. AIA

Acknowledged and Agreed to by:

_____, as Contractor

By: _____
Name: _____
Title: _____

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1000
SUMMARY OF CONTRACTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PROJECT

A. Project Name: CV Starr Cafetorium Addition, Interior Renovation & Related Work

B. Facility Name: CV Starr Intermediate School

C. Brewster Central School District . Brewster Central School District

D. Architect's Name: Fuller and D'angelo.

E. Construction Manager: Triton Construction

F. The Project consists of the CV Starr Cafetorium Addition, Interior Renovation & Related Work and Related Work at the CV Starr Intermediate School, 20 Farm To Market Road, Brewster, New York 10509.

G. The work at the CV Starr IS includes but is not limited to:

1. New steel frame structures, masonry clad additions and related work.
2. New Additions include new Cafetorium, Stage, Kitchen, Offices, Toilets, Storage, Elevator, Lift and Stairs.
3. Alterations and renovations to existing interiors as indicated on drawings.
4. All related Plumbing, Mechanical and Electrical work as indicated on drawings.
5. New Paving and walks and additional site work as indicated on drawings.
6. Alternates as listed in specifications and indicated on drawings.

1.3 DEFINITIONS

A. Refer to Section 07200 General Conditions and Section 01 4216 for Definitions.

1.4 CONTRACT DESCRIPTION

A. Contract Type: Multiple prime contracts, each based on a Stipulated Price as described in herein.

B. Multiple contracts are separate contracts, representing significant construction activities, between Owner and separate contractors. Each contract is performed concurrently and coordinated closely with construction activities performed on Project under other contracts. Contracts for this Project include the following:

1. Contract #1 General Construction and Site Work.
2. Contract #2 Plumbing.
3. Contract #3 Heating, Ventilating, Air-Conditioning.
4. Contract #4 Electrical.

C. The work of each Contractor is identified in this Project Manual and on the Drawings.

D. 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 contractor(s) shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.

E. If it becomes necessary to refer to the contract documents to determine which prime Contract includes a specific element of required work, begin by referring to the prime Contracts, themselves; then, if a determination cannot be made from the prime Contracts, refer, in the following order, to the Supplementary Conditions, this section of the Specifications, followed by the other Division-l sections and finally with the Drawings and other Sections of the Specifications.

F. If, after referring to the contract documents, it cannot be clearly determined which prime Contractor will perform a specific item of required work, then, that item of work will be brought to the Architect's attention in writing for determination.

G. Summary by References: Work of the prime contracts can be summarized by reference to the prime contract(s), General Conditions, Bidding Requirements, Specification sections, Drawings, Addenda, Modifications, or Appendix to Contract Documents issued subsequent to the initial printing of this Project Manual, and including but not necessarily limited to printed material referenced by any of these. It is recognized that the work of the prime Contracts is unavoidably affected or influenced by governing regulations, natural phenomenon, including weather conditions, and other forces outside the contract documents.

1.5 RELATED REQUIREMENTS

A. Section 00 4440 - Owner Supplied - Contractor installed items.

B. Section 00 5200 - Agreement Form: Contract Sum, retainages, payment period.

C. Section 00 7200 - General Conditions: Additional requirements for progress payments and Changes in the Work.

D. Section 007310 - Special Provisions.

E. Section 01 1010 - Milestone Schedule.

F. Section 01 2000 - Price and Payment Procedures.

G. Section 01 2100 - Allowances.

H. Section 01 2300 - Alternates: Payment procedures relating to alternates.

I. Section 01 3553 - Site Safety and Security Procedures.

J. Section 01 5000 - Temporary Facilities and Controls.

K. Section 01 7000 - Execution.

L. Reference Drawing - Site Safety and Logistic Plan will be provided by the Construction Manager.

1.6 JURISDICTIONAL DISPUTES

A. It is not the intention of these specifications to transgress the jurisdictional arrangements regarding the division of work between the several trades. Should it appear, however, that these specifications imply that other trades are to perform work which is claimed by any other trades, each Contractor affected shall notify the Architect and Construction Manager of such fact when submitting his proposal, indicating the additional amount required to include the work in question in the Base Bid. In the event that no such notification is received prior to an acceptance of the Contractor's Proposal, it will be construed that the specifications imply nothing which is unacceptable to the various trades and no extra payments on this account will be granted to any Contractor during the progress of the job.

B. Each Contractor shall only employ labor on the project or in connection with its work capable of working harmoniously will all trades, crafts and any other individuals associated with the capital improvement work to be performed. There shall be no strikes, picketing, work stoppages, slowdowns or other disruptive activity at the project for any reason by anyone employed or engaged by the Contractor to perform its portion of the work. There shall be no lockout at the project by the Contractor. The Contractor shall be responsible for providing the manpower required to proceed with the work under any circumstance. Should it become necessary to create a separate entrance for a contractor involved in a labor dispute, all costs associated with creating that entrance shall be borne by the contractor involved in the dispute. Such costs shall include, but not be limited to, signage, fencing, temporary roads and security personnel as deemed necessary by the Owner for the safety of the occupants of the site.

C. If the Contractor has engaged the services of workers and/or subcontractors who are members of 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 or the Owner, any conflict between its agreement with

the Owner and any agreements or regulations of any kind at any time in force among members or councils which regulate or distinguish what activities shall not be included in the work of any particular trade.

D. The Contractor shall ensure that its work continues uninterrupted during the labor dispute and will be liable to the Owner for all damages suffered by the Owner occurring as a result of work stoppages, slowdowns, disputes or strikes.

1.7 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is shown on drawings.

B. Scope of alterations work is indicated on drawings.

C. Existing Systems: Alter existing system and add new construction, keeping existing in operation
   1. Plumbing.
   2. HVAC including ATC systems
   3. Electrical Power and Lighting.
   4. Fire Alarm.
   5. Telephone and data.
   6. Security System
   7. Access Control.

D. Brewster Central School District will remove and re-install, from all existing rooms being renovated, the following before start of work:
   1. TV’s, smart boards, furniture, books and clocks.

1.8 OWNER OCCUPANCY

A. Refer to reference drawing "Site Safety and Logistics Plan" by Construction Manager.

B. Brewster Central School District intends to continue to occupy adjacent portions of the existing building during the school year and times when construction is restricted. Refer to paragraph 1.9.F.

C. Cooperate with Brewster Central School District to minimize conflict and to facilitate Brewster Central School District's operations.

D. For the year 2025 the contractor shall be allocated the same number of days and times. When the days and times have been determined the contractors will be advised.

E. Schedule and coordinate all Work to accommodate Owner's occupancy with the Construction Manager.

1.9 CONTRACTORS USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas of work as directed by Construction Manager.

B. **Refer to "Site Safety and Phasing Plans".**

C. Arrange use of site and premises to allow:
   1. Brewster Central School District occupancy.
   2. Work by Others.
   3. Work by Brewster Central School District.
   4. Use of site and premises by the public.

D. Provide access to and from site as required by law and by Brewster Central School District:
   1. Emergency Building Exits During Construction: Keep all exits required by code or directed by the Construction Manager, open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

E. Existing building spaces may not be used for storage unless approved by the Owner.

F. **Time Restrictions:**
   1. Limit conduct of especially noisy exterior work to the hours of 3:30 pm to 8:00 PM..

2. Owner's representative(s) will cover the project for the standard 8 hour Monday-Friday shift. If contractor requests additional hours **to make up schedule time**, contractor will need to reimburse owner for any additional coverage or costs (e g - Construction Manager, custodian, security) at their contractual rates.
3. Contractors will be restricted from construction activities as follows:
4. For the years 2025-2026 the Contractors shall be restricted for the the same times.The specific dates will be provided when scheduled by the Owner.

G. Contractors shall comply with Local Noise Ordinance. Work disrupting the community must be performed within the following hours:
1. Monday thru Friday: 8 AM to6 PM.
2. Weekends/ Holidays: 9 AM to 6 PM.
   a. In the event of Time(s) conflict between spec and Code, stricter Time restriction shall take precedence.)
3. The CV Starr IS is within the boundaries of the Village Of Brewster, Town of Southeast.
4. The Town of Southeast Noise Ordnance, (Town Code: Chapter 96,Ordinance available on Town of Southeast web site)
   a. No person, individual, firm, or corporation shall operate any construction equipment, machinery, tool or other device that makes noise audible beyond the property on which it is located except during the following hours and except as provided by Ordinance.
      a) Weekdays (except holidays) between 8:00 a.m. and 6:00 p.m. or dusk, whichever is earlier.
      b) Saturdays (except holidays) between 9:00 a.m. and 4:00 p.m.
      c) Sundays and holidays, no hours of operation.

H. Construction deliveries shall not occur during the hours of 7:30 AM and 9:00 AM and 2:00 PM and 3:00 PM, when school buses are arriving or leaving the school grounds.

I. During the entire construction period the prime contractors shall have limited use of the premises for construction operations, including use of the site as indicated in phasing and schedule of work time table included in this section.
1. General: Limitations on site usage as well as specific requirements that impact utilization are indicated on the drawings and/or by other contract documents. In addition to these limitations and requirements, the Construction Manager shall administer allocation of available space equitably among the separate prime contractors and other entities needing access and space, so as to produce the best overall efficiency in performance of the total work of the project. Each Prime Contractor shall schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.
2. The Prime Contractors shall limit their use of the premises to the work indicated, so as to allow for Owner occupancy and use by the public during the period when the Owner occupies the building.
3. Contractors are to maintain clear and unobstructed paths of exit discharge from all existing exits.
4. Each Prime Contractor shall confine operations on the premises to areas designated by the Construction Manager and permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the Premises with any materials or equipment. The Prime Contractor shall coordinate all operations with, and secure approval from, the Construction Manager, before using any portion of the premises. Field personnel are to be confined to the work area assigned.
5. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials.
6. Lock automotive type vehicles such as passenger cars and trucks and other types of mechanized and motorized construction equipment, when parked and unattended, to prevent unauthorized use.

Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

J. Only materials and equipment, which are to be used directly in the work, shall be brought to and stored on the project site by the Contractor. After equipment is no longer required for the work, it shall be 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 Contractors.

K. Site work shall be scheduled and coordinated with Construction Manager. The Construction Manager decisions shall be final and binding on all contractors.

1. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction

L. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated or directed by . If additional storage is necessary obtain and pay for such storage off-site.

M. The Contractor(s) and any entity for which the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Construction Manager, which may be withheld in the sole discretion of the Construction Manager.

N. 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. Without limitation of any other provision of the Contract Documents, each contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of:

1. Any areas and buildings adjacent to the site of the work or;
2. The Building in the event of partial occupancy as more..

O. Without prior approval of the Owner and Construction Manager, each Prime Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitations, lavatories, toilets, entrances and parking areas other than those designated by the Construction Manager. Without limitation of any other provision of the Contract Documents, Each Contractor shall use its best efforts to comply with the rules and regulations promulgated by the Owner and Construction Manager in connection with the use and occupancy of the Project Site, and the Building, as amended Owner from time to time. Each Contractor shall immediately notify the Construction Manager in writing if during the performance of the Work, the Contractor finds compliance with 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. Construction Manager may, in the Construction Manager's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations. Each Contractor shall also comply with all insurance and indemnification requirements, applicable to use, and occupancy of the Project Site and the Building.

P. Maintain the existing building in a safe and weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. When work is scheduled after hours clean and remove all temporary barriers and protection so that the building can be occupied the following day when normal building occupancy will occur.

Q. Keep public areas such as hallways, stairs, elevator lobbies, and toilet rooms free from accumulation of waste material, rubbish or construction debris.

R. Smoking, drinking of alcoholic beverages or open fires will not be permitted on the project site.

S. Utility Outages and Shutdown:

1. Limit disruptions, shut downs, switch overs, etc. of utility services to hours the building is unoccupied, Saturdays, Sunday and/or holidays. Arrange at least 72 hours in advance with Construction manager and owner.
2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers, fire alarm system, electrical, data, and heatiing system, without 7 days notice to Brewster Central School District and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

1.10 AVAILABILITY OF EXISTING BUILDING

A. The existing site and building work areas will be available to the Contractor(s) as follows:
   1. Notice of Award Prior to Start of Construction
      a. 7:00 AM to 4:00 PM Monday thru Friday only when programs and school occupancy are not disrupted and with the approval of the Owner.
   2. Start of Construction to Completion date.
      a. 7:00 AM to 10:30 PM Monday thru Saturday, except for restricted times as listed in paragraph 1.9.F.
      b. **Work will only be permitted after 4:00 PM and Saturday if the contractor(s) has worked 7:00 AM to 4:00 PM Monday thru Friday and 4:00 PM to 10:30 PM is approved by the Construction Manager.**
      c. When the facility is closed Contractors may work providing no access into the existing facility is required. Access to the building may be authorized if requested 48 hours in advance to the Construction Manager and cost for school personnel is paid for by the Contractor.
   3. After Scheduled Completion Date
      a. 4:30 PM thru 10:30- PM Monday thru Saturday only when programs and school occupancy are not disrupted and with the approval of the Construction Manager.
   4. Construction operation which create dust, noise or fumes, particularly welding operations shall be scheduled after school hours, when directed by the Construction Manager.
   5. If asbestos is discovered, **Asbestos Abatement shall be performed when the building is unoccupied.**

B. Upon request by the Contractor, the building may be made available, at the discretion of the Construction Manager, and at the Cost of the Contractor, during such times as are allowed by local noise ordnance, in addition to the above listed hours. A request for use during these off-regular hours must be made at least two (2) days before the use. Such off-hours may include Sundays and Holidays.

C. If the Contractor requests the use of the facility for off-hours to maintain the scheduled completion date, the Contractor shall pay all additional costs in connection with opening, providing security and project management expenses incurred with no costs to the Owner. All expenses shall be deducted from the Contractors contract price. Comply with other portions of this Section.
   1. Weekend, Holiday and Night Work:
      a. The contractor shall make no claim for delay for the inability of the Construction Manager to make the site available for off-hours work. Should the Construction Manager make the site available during these hours at the contractor's request, the cost will be borne by the Contractor.

D. ALL CONTRACTORS SHALL BE REQUIRED TO PERFORM SCHEDULED WORK WITHIN THE EXISTING BUILDING ONLY DURING THE TIME PERIODS INDICATED AND SHALL INCLUDE IN THE BID ALL COSTS FOR LABOR, MATERIAL, ETC. INCLUDING PREMIUM TIME TO PERFORM THE WORK, PER PHASE PER TIME PERIOD TO MEET THE MILESTONE COMPLETION DSATES.

1.11 COMPLETION OF WORK AFTER SCHEDULED COMPLETION DATE

A. In the event the contractor does not complete the work as scheduled all work to be performed shall be performed after 4:30 PM when the building is unoccupied and approved by the Construction Manager. All added costs for work after the completion date shall be borne by the Contractor.

B. Each Contractor shall prepare a progress schedule in detail listing items of work, sections of building and the time required for each.

C. Each Contractors shall provide necessary manpower, equipment, etc., as required to maintain schedule developed within the time limitations as described above.

D. School Calender is available on the Owner's web site. Calendar is subject to modifications for civil service holidays, changes in education programs, snow days, etc.

1.12 WORK SEQUENCE

A. Refer to Section 01 1010 - Milestone Schedule.

1.13 SPECIFICATION SECTIONS APPLICABLE TO EVERY CONTRACT

A. Unless otherwise noted, ALL Provisions of Division 00 and 01 listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 0115 LIST OF DRAWING SHEETS
00 2113 BIDDING REQUIREMENTS
00 2115 RFI FORM
00 4100 BID FORM - CONTRACT #1 - GENERAL CONSTRUCTION
00 4110 BID FORM - CONTRACT #2 - PLUMBING CONTRACTOR
00 4120 BID FORM - CONTRACT #3 - MECHANICAL CONTRACTOR
00 4130 BID FORM - CONTRACT #4 - ELECTRICAL CONTRACTOR
00 4301 - BID FORM SUPPLEMENTS COVER SHEET
00 4440 - OWNER SUPPLIED - CONTRACTOR INSTALLED ITEMS
00 4401 QUALIFICATIONS OF BIDDERS
00 4402 - HOLD HARMLESS AGREEMENT
00 4460 CERTIFICATION OF COMPLIANCE WITH THE IRAN DISINVESTMENT ACT
00 4470 DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT.
00 4476 INSURANCE CERTIFICATION
00 5200 FORM OF AGREEMENT
00 6000 BONDS AND CERTIFICATES
00 7200 GENERAL CONDITIONS
00 7310 SPECIAL PROVISIONS

DIVISION 01 - GENERAL REQUIREMENTS

01 1000 SUMMARY OF CONTRACTS
01 1010 MILESTONE SCHEDULE
01 2000 PRICE AND PAYMENT PROCEDURES
01 2005 PARTIAL RELEASE OF LIEN
01 2100 ALLOWANCES
01 2300 ALTERNATES
01 2500 SUBSTITUTION PROCEDURES
01 3000 ADMINISTRATIVE REQUIREMENTS
01 3216 CONSTRUCTION PROGRESS SCHEDULE
01 3306 NON-DISCRIMINATION CLAUSES

01 3307 SED SPECIAL REQUIREMENTS
01 3553 SITE SAFETY AND SECURITY PROCEDURES
01 3554 PREVAILING WAGE RATES
01 4000 QUALITY REQUIREMENTS
01 4100 REGULATORY REQUIREMENTS
01 4216 DEFINITIONS
01 4219 REFERENCE STANDARDS
01 4533 CODE REQUIRED SPECIAL INSPECTIONS
01 5000 TEMPORARY FACILITIES AND CONTROLS
01 5050 PIPE SCAFFOLDING AND SIDEWALK BRIDGES
01 5213 FIELD OFFICES AND SHEDS
01 5500 VEHICULAR ACCESS AND PARKING
01 5527 TRAFFIC MAINTENANCE AND PROTECTION
01 5719 TEMPORARY ENVIRONMENTAL CONTROLS
01 5721 INDOOR AIR QUALITY CONTROLS
01 5813 TEMPORARY PROJECT SIGNAGE
01 6000 PRODUCT REQUIREMENTS
01 6116 VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS
01 6190 MATRIX OF BUILDING SYSTEM RESPONSIBILITY
01 7000 EXECUTION
01 7310 CUTTING AND PATCHING
01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 7600 PROCEDURES & SPECIAL CONDITIONS FOR SEPARATE PRIME CONTRACTS
01 7800 CLOSEOUT SUBMITTALS
01 7900 DEMONSTRATION AND TRAINING
01 9113 GENERAL COMMISSIONING REQUIREMENTS

APPENDIX

ENVIRONMENTAL SURVEY
GEOTECHNICAL REPORT

1.14 CONTRACT #1 - GENERAL CONSTRUCTION

1.15 The work of the General Construction Contract includes but not limited to the following:

DIVISION 03 - CONCRETE

03 3000 CAST-IN-PLACE CONCRETE
03 5400 CAST UNDERLAYMENT

DIVISION 04 - MASONRY

04 2000 UNIT MASONRY
04 7200 CAST STONE MASONRY

DIVISION 05 - METALS

05 1200 STRUCTURAL STEEL
05 2100 STEEL JOIST FRAMING
05 3100 STEEL DECKING
05 4000 COLD-FORMED METAL FRAMING
05 5000 METAL FABRICATIONS
05 5100 METAL STAIRS
05 5213 PIPE AND TUBE RAILINGS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
- 06 1000 ROUGH CARPENTRY
- 06 1010 ROOF RELATED ROUGH CARPENTRY
- 06 2000 FINISH CARPENTRY

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
- 07 1113 BITUMINOUS DAMPPROOFING
- 07 1300 SHEET WATERPROOFING
- 07 2100 THERMAL INSULATION
- 07 2500 WEATHER BARRIERS
- 07 4100 PRE-FORMED METAL STANDING SEAM ROOF
- 07 4213 ALUMINUM SOFFIT PANELS
- 07 4213.19 INSULATED METAL WALL PANELS
- 07 5010 MODIFICATIONS TO EXISTING ROOFING
- 07 5323 EPDM WRAPPED DUCTWORK
- 07 5419 PVC ROOFING
- 07 6200 SHEET METAL FLASHINGS & SPECIALTIES
- 07 7100 ROOF SPECIALTIES
- 07 7200 ROOF ACCESSORIES
- 07 8100 APPLIED FIREPROOFING
- 07 8400 FIRESTOPPING
- 07 9200 JOINT SEALANTS
- 07 9513 EXPANSION JOINT COVER ASSEMPLIES

DIVISION 08 - OPENINGS
- 08 1113 HOLLOW METAL DOORS AND FRAMES
- 08 1613 FIBERGLASS DOORS AND ALUMINUM FRAMES
- 08 3100 ACCESS DOORS AND PANELS
- 08 5113 ALUMINUM WINDOWS
- 08 5123 STEEL FIRE RATED WINDOWS
- 08 6200 UNIT SKYLIGHTS
- 08 7100 FINISH HARDWARE
- 08 8000 GLAZING
- 08 9100 LOUVERS

DIVISION 09 - FINISHES
- 09 2116 GYPSUM BOARD ASSEMBLIES
- 09 3000 TILING
- 09 5100 ACOUSTICAL CEILINGS
- 09 6500 RESILIENT FLOORING
- 09 6623 RESINOUS MATRIX TERRAZZO TILE
- 09 6725 EPOXY RESIN FLOORING
- 09 8404 ACOUSTIC PANELS
- 09 9113 EXTERIOR PAINTING
- 09 9123 INTERIOR PAINTING

DIVISION 10 - SPECIALTIES
- 10 1101 VISUAL DISPLAY BOARDS
- 10 1400 SIGNAGE
- 10 2113 PLASTIC TOILET COMPARTMENTS

10 2213 WIRE MESH PARTITIONS
10 2601 CORNER GUARDS
10 2800 TOILET AND BATH ACCESSORIES
10 4400 FIRE PROTECTION SPECIALTIES

DIVISION 11 - EQUIPMENT
11 4000 FOOD SERVICE EQUIPMENT
11 5213 PROJECTION MOUNTS, PROJECTOR AND SCREENS
11 6143 STAGE CURTAINS

DIVISION 12 - FURNISHINGS
12 2113 HORIZONTAL LOUVER BLINDS
12 2940 ROLLER SHADES
12 3200 PLASTIC LAMINATED CASEWORK
12 3600 SOLID SURFACING WINDOW SILLS AND COUNTERTOPS
12 4813 ENTRANCE FLOOR MATS AND FRAMES

DIVISION 14 - CONVEYING EQUIPMENT
14 2100 ELECTRIC TRACTION ELEVATORS
14 4200 WHEELCHAIR LIFTS

DIVISION 31 - EARTHWORK
31 1000 SITE CLEARING
31 2200 EARTH MOVING
31 2319 DEWATERING
31 2333 TRENCHING AND BACKFILLING
31 2513 EROSION AND SEDIMENT CONTROL
31 5000 EXCAVATION SUPPORT AND PROTECTION

DIVISION 32 - EXTERIOR IMPROVEMENTS
32 1216 ASPHALT PAVING
32 1313 CONCRETE PAVING AND CURBS
32 1714 TRAFFIC SIGNS
32 1723.13 PAVEMENT MARKINGS
32 1726 TACTILE WARNING SURFACING
32 3113 CHAIN LINK FENCING AND GATES
32 3119 DECORATIVE METAL FENCE
32 9200 TURFS AND GRASSES

DIVISION 33 - UTILITIES

33 1400 WATER UTILITY TRANSMISSION AND DISTRIBUTION

33 3000 SANITARY SEWERAGE

33 4100 STORM UTILITY DRAIN PIPING

33 3211 WASTEWATER PUMP STATION

A. **Special Notes: Contract #1 GC - GENERAL CONTRACTOR**

1. Access doors furnished by trade requiring access; installation by General Contractor in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.
2. All existing ceiling removal /replacements necessary to install General Contractor work will be by General Contractor including temporary support for all lighting fixtures, smoke detectors, etc.

3. General Contractor and subcontractors will not be allowed to use existing or new plumbing fixtures to wash out mortar pans, grout, adhesives, etc.
4. All new roof curbs and pipe portals are supplied by Mechanical Contractor and installed by General Contractor. Cutting penetrations, steel support, and temporary weather protection by General Contractor. Curbs will be flashed / watertight in accordance with roofing section. Hole patching (structural, PVC, EPDM, etc.) for roof areas which result from Mechanical demolition of existing rooftop units will be by Contract for General Contractor.
5. General Contractor will restore / patch any finishes damaged by their abatement subcontractor's protections, tape, etc.
6. All staging area work as indicated on drawings (temporary sidewalk bridge, drives / walks, parking areas, for use by all trades, etc.) is by General Contractor, except temporary power.
7. General Contractor is responsible to provide negative air machines to ventilate all work areas during tasks involving odors, dust, fumes (epoxy floor, painting, etc.)
8. Exterior wall louvers for mechanical items shall be furnished and installed by General Contractor.
9. Excavation for concrete footings and bases for exterior lighting by General Contractor. New lighting and footings are provided and installed by the Electrical Contractor.
10. Outdoor equipment pads is by General Contractor.
11. Within the existing basement all cutting of all interior slabs, excavation, utility trenching, bedding, warning tape, backfill and finishing shall be performed by the each Contractor. General Contractor shall provide final floor finish.
12. All exterior and interior excavation, utility trenching, bedding, warning tape, backfill, concrete pipe cover. and finishing shall be performed by the General Construction Contractor. Each M/E/P contractor is responsible for cleaning/flushing/purging, capping of piping etc. for abandoned utility(s).
13. Protection of trenches is by General Contractor.
14. GC shall provide Shoring Drawings, designed, signed and sealed by a professional engineer licensed in the state of New York.
15. All phasing work as indicated on phasing drawings.
16. GC shall excavate and set Grease Interceptor provided by the P-Contractor.
17. GC shall install new Fire Water service Line from source up to 5 feet from the building line. PC shall connect and continue into building as indicated.

1.16 CONTRACT #2 - PLUMBING

A. Specification sections listed above as applicable to every contract.

B. Work in the Plumbing Contractor Contract #2 includes, but is not limited to, the following:

DIVISION 03 - CONCRETE
03 3000 CAST-IN-PLACE CONCRETE

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
06 1000 ROUGH CARPENTRY

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
07 8400 FIRESTOPPING
07 9200 JOINT SEALANTS

DIVISION 22 – PLUMBING (All Div. 22 Sections)

C. **Special Notes: Contract for - PLUMBING CONTRACTOR**

1. Any wood blocking for Plumbing Contract, items by Plumbing Contractor.
2. All existing ceiling removal / replacements necessary to install new PC work will be by PC Contractor unless otherwise noted, Includes temporary supports for light fixtures, smoke detectors, etc.

3. Access doors furnished by trade requiring access; installation by General Contractor. in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.
4. Plumbing Contractor shall install an inflatable ball in all new plumbing fixtures to prevent construction debris or grout from entering sub-slab piping. Ball will be deflated / removed at the conclusion of the project as directed by the CM.
5. PC will install sealant around perimeter of all toilet / plumbing fixtures.
6. Interior house keeping pads for plumbing equipment by plumbing contractor.
7. Grease Interceptor tank provided and piped by P-Contractor.

1.17 CONTRACT #3 - HVAC

A. Specification sections listed above as applicable to every contract.

1.18 Work in the HVAC Contract #3 includes, but is not limited to, the following:

DIVISION 03 - CONCRETE
03 3000 CAST-IN-PLACE CONCRETE

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
06 1000 ROUGH CARPENTRY

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
07 8400 FIRESTOPPING
07 9200 JOINT SEALANTS

DIVISION 23 - HVAC (All DIv.23 Sections)

DIVISION 31 - EARTHWORK
31 2316 - EXCAVATION

A. **Special Notes: Contract #3 - HVAC CONTRACTOR**

1. Any wood blocking for HVAC Contract items by HVAC Contractor.
2. All existing ceiling removal / replacements necessary to install new HVAC Contract work will be by HVAC Contractor unless otherwise noted. Includes temporary supports for light fixtures, smoke detectors, etc.
3. Interior housekeeping pads for HVAC equipment by HVAC Contractor.
4. Access doors furnished by trade requiring access; installation by General Contractor in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.
5. Disconnects, Motor starters, etc. supplied by HVAC Contractor installed by Electrical Contractor, unless noted otherwise.
6. If new mechanical units are too large to fit through existing doorways the mechanical contractor will either disassemble equipment into sections, or remove masonry to enlarge opening and reconstruct to match (at no additional costs to Owner). MC shall notify Architect of proposed removals prior to removal. Architect / Engineer shall review for structural and other concerns. Removals shall not proceed without Architect / Engineer prior review and written approval. MC shall be responsible for all additional costs incurred by the Architect / Engineer review including structural analysis.
7. All new roof curbs and pipe portals shall be supplied by HVAC Contractor (installed by General Contractor).
8. Any interior exhaust grilles or wall louvers for mechanical items are by HVAC Contractor including opening, lintels, caulking, etc.
9. Cutting of all interior slabs, excavation, utility trenching, bedding, warning tape, backfill, patching and finishing shall be performed by the each Contractor.

1.19 CONTRACT #4 - ELECTRICAL CONTRACTOR

A. Specification sections listed above as applicable to all contracts

B. Work in the Electrical Contract includes, but is not limited to, the following:

DIVISION 03 - CONCRETE
- 03 3000 CAST-IN-PLACE CONCRETE

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
- 06 1000 ROUGH CARPENTRY

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
- 07 8400 FIRESTOPPING
- 07 9200 JOINT SEALANTS

DIVISION 26 - ELECTRICAL (All Div. 26 Sections, including items supplied by Owner as listed in Section 00 4440.)

DIVISION 31 - EARTHWORK
- 31 2316 EXCAVATION

C. **Special notes: Contract #4 - ELECTRICAL CONTRACT (EC)**

1. VFD's, disconnects, motor starters which are supplied by Mechanical Contractor will be installed by Electrical Contractor unless noted otherwise.
2. All existing ceiling removal / replacement necessary to install new electrical work to be by Electrical Contractor unless otherwise noted. Includes temporary supports for light fixtures, smoke detectors, etc.
3. Access doors furnished by trade requiring access; installation by for General Contractor. in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.
4. Interior housekeeping pads for electrical equipment by Electrical Contractor.
5. Interior (basement of existing building) excavation, utility trenching, bedding, warning tape, backfill and concrete slab replacement shall be performed by the Electrical Contractor. The Electrical Contractor shall patch 1/8" below finish floor for General Contractor final finishes. The Electrical Contractor is responsible for cleaning, flushing, purging, capping of piping etc. for abandoned utility(s).
6. If the electrical switchgear panels are too large to fit through existing openings, electrical contractor will remove masonry to enlarge the opening and reconstruction to match (at no additional cost to Owner). EC shall notify Architect of proposed removals prior to removal. Architect / Engineer shall review for structural and other concerns. Removals shall not proceed without Architect / Engineer prior review and written approval. EC shall be responsible for all additional costs incurred by the Architect / Engineer review including structural analysis.
7. Any wood blocking or panel backboards for electrical items by Electrical Contractor.
8. Electric Contractor will tie up and secure with zip ties or J hooks, 5' oc, any existing cabling or wiring which sags below ceiling after any ceiling removals.
9. Temporary power as indicated on drawings and as required by OSHA regulations.
10. Any existing devices impacted by temporary partition installation (fire alarm strokes, bells, fixtures, devices, etc.) will be disconnected and reinstalled onto temporary partitions. When temporary partitions are removed then reinstall onto permanent surfaces.
11. Any solenoid valves will be supplied and installed by Plumbing Contractor. Electrical power wiring supply and install by Electrical Contractor.
12. Electrical Contractor shall firestop electrical back boxes, where required, in fire rate partitions as per detail.
13. All work for Audio Visual Public Address System and Fire Alarm shall be performed by the Electrical Contractor.

14. All wiring for Audio-visual, Public address system, Fire Alarm, Data, Phone, etc; shall be performed by the Electrical Contractor.
15. Concrete footing and bases for exterior lamp posts and bollards shall be by the Electrical Contractor. Include all trenching for wiring and connectivity.
16. Temporary electrical work as indicated on phasing drawings.
17. All Security Equipment will be supplied by the Owners vendor and installed by EC- Contractor.
18. Refer to specification Section 01 6190 - Matrix of Building Systems Responsibilities for additional information.

END OF SECTION

SECTION 01 1010
MILESTONE SCHEDULE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Milestone Construction schedule for project durations and phases, all contracts.

B. Related Sections include the following:
   1. Section 01 1000 - Summary of Contracts for work related to each Prime Contract.
   2. Section 01 3000 - Administrative Requirements for administrative requirements governing preparation and submittal of Prime Contractors' Construction Schedule.
   3. Section 01 3216 - Construction Progress Schedule governing preparation of Prime Contractors' Construction Schedule.
   4. Section 01 7800 - Closeout Submittals.

1.3 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 activities are activities on the critical path. They must start and finish on the planned early start and finish times.

C. Predecessor activity is an activity that must be completed before a given activity can be started.

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

E. Event: The starting or ending point of an activity.

F. Major Area: A story of construction, a separate building, or a similar significant construction element.

G. Milestone: A key or critical point in time for reference or measurement.

1.4 REGULATORY REQUIREMENTS

A. Comply with Section 01 3553 - Site Safety and Security Procedures including ID badge, safety vest, hard hat, etc. and all other required personal protective equipment as required by OSHA.
   1. Failure to abide by the aforementioned rules in paragraph (B) not limited to the Owner's requirements, and OSHA' safety rules and regulations, and without prior notice shall result in the removal of said individual from the site

1.5 MILESTONE SCHEDULE PREPARATION

A. A Master Schedule will be developed at a general meeting of all successful prime contractors within 10 days of Letter of Intent or Award of the Contracts. Each prime contractor will coordinate activities, forward submittals, deliver materials and provide necessary manpower to meet the milestones listed below.

1.6 REQUIREMENTS

A. By submitting his/her bid the contractor acknowledges and certify that the project will be completed by the Substantial Completion date and that his/her total base bid has been submitted in accordance with all specification and drawing requirements.

B. All contractors and their subcontractor's project superintendent, employees, directly or indirectly employed by the contractor to work on the project must at all times, whenever on the school property,

wear an ID badge, safety vest, hard hat, etc. and all other required personal protective equipment as required by OSHA.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

3.1 MILESTONE SCHEDULE

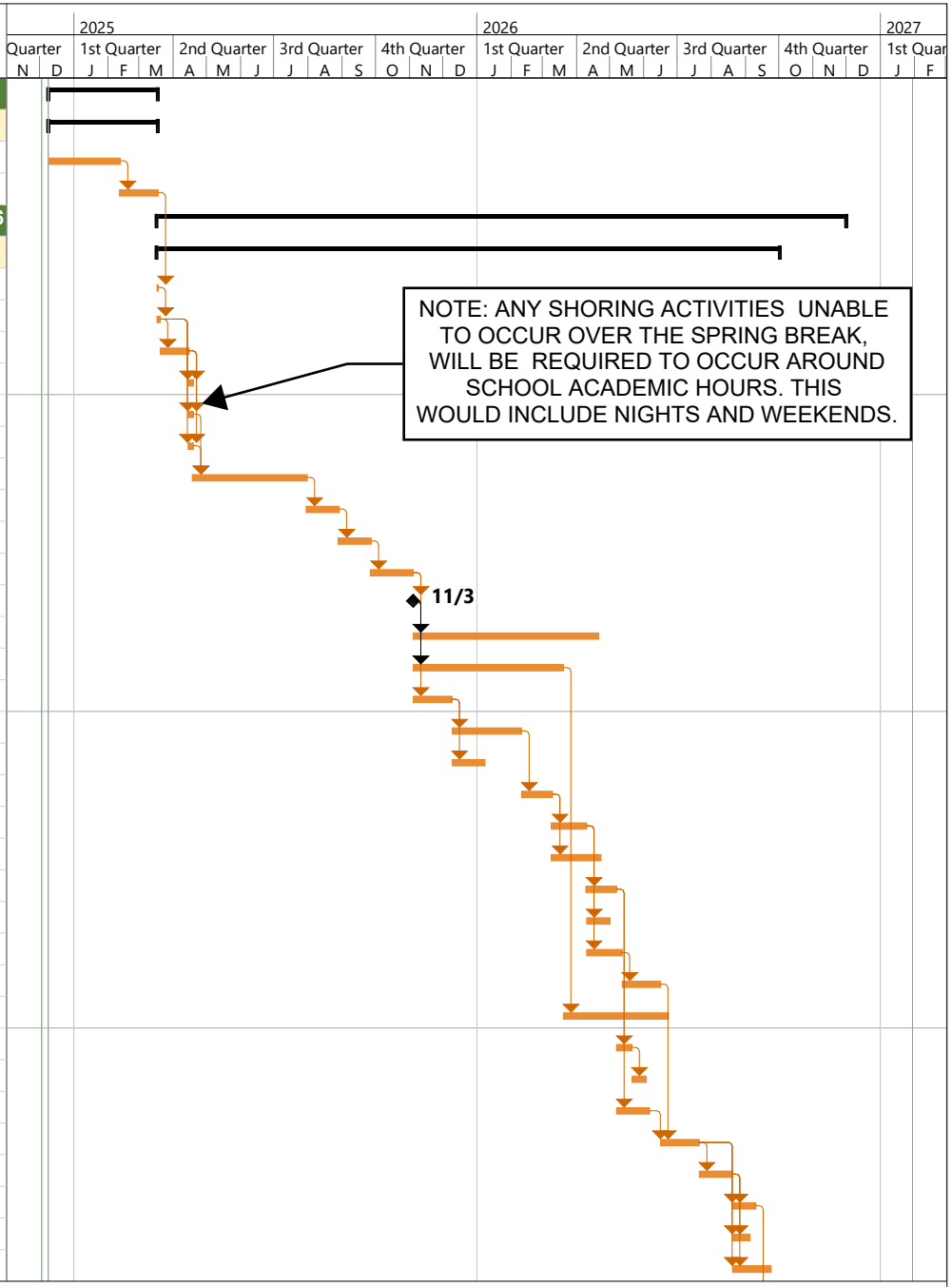
A. Building Hours: Refer to Section 01 1000 - Summary of Contracts.

B. Administrative Schedule

1.	Drawings out to Bid	Date 12/9/24
2.	Pre-Bid Meeting	Date 12/17/24
3.	Contractor's RFIs Due	Date 1/9/25
4.	Bids Received	Date 1/16/25
5.	Bidders Qualification Meetings	Date 1/20-23/25
6.	Tentative Bid Award	Date 2/11/25
7.	Contracts, Bonds and Insurance	10 days after Contract Award/Letter of Intent
8.	Construction Schedule - General Construction	10 days after Contract Award/Letter of Intent
9.	Construction Schedule Final	21 days after Contract Award /Letter of Intent

END OF SECTION

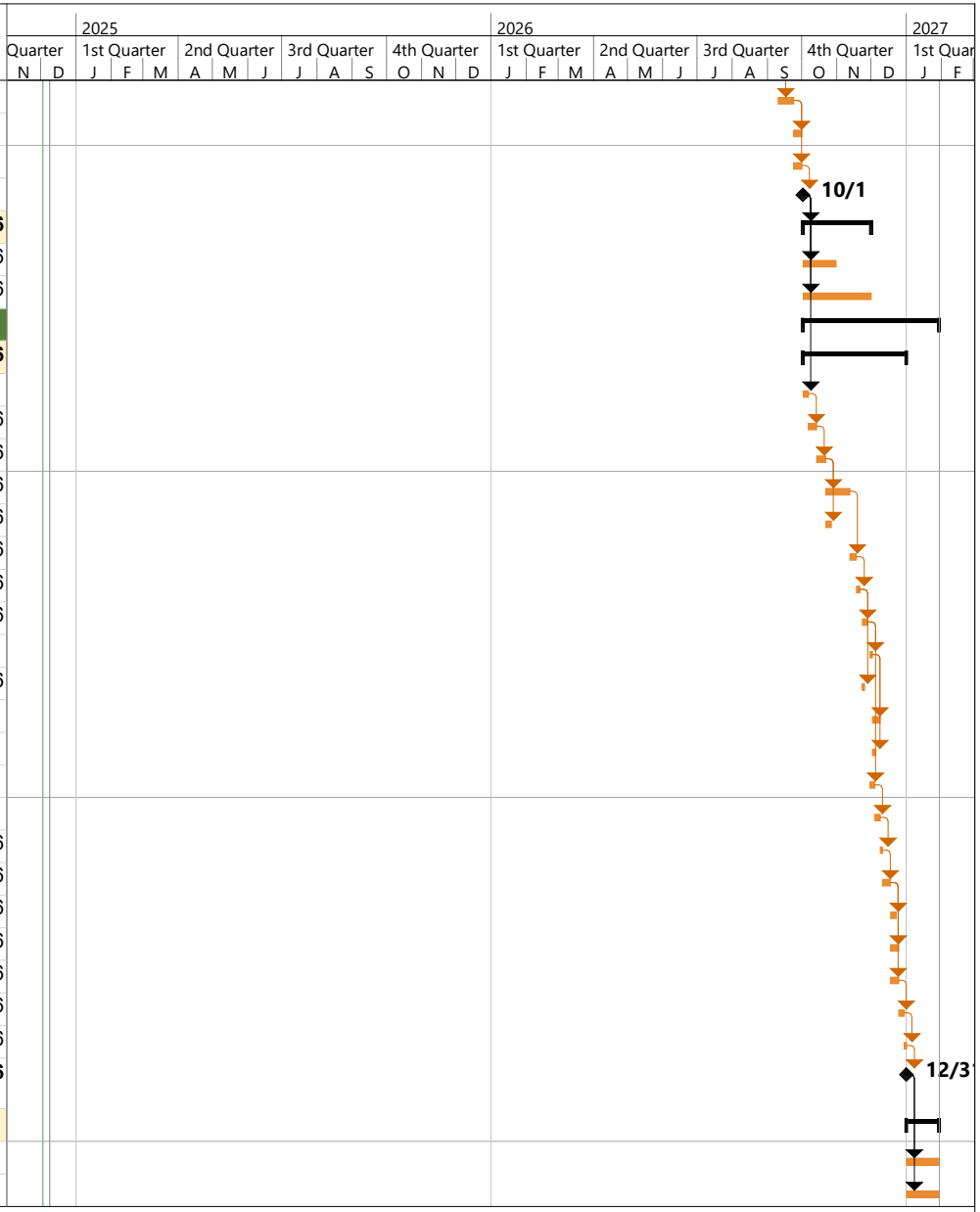
ID	Task Name	Duration	Start	Finish
1	**CV STARR IS CAFTETORIUM ADDITION, INTERIOR RENOS & RELATED WORK**	**71 days**	**12/9/24**	**3/17/25**
2	**PRE-CONSTRUCTION**	**71 days**	**12/9/24**	**3/17/25**
3	BID & AWARD	47 days	12/9/24	2/11/25
4	PRECONSTRUCTION (B&I, CONTRACTS, SUBMITTALS)	25 days	2/11/25	3/17/25
5	**CAFETORIUM ADDITION**	**446 days**	**3/17/25**	**11/30/26**
6	**CONSTRUCTION**	**404 days**	**3/17/25**	**10/1/26**
7	STAGING, FENCING START OF EXCAVATION	1 day	3/17/25	3/17/25
8	SITE/MEP MARK OUT & STAKEOUT	3 days	3/17/25	3/19/25
9	INSTALL REROUTED UTILITIES FOR FOUNDATIONS	18 days	3/20/25	4/14/25
10	RECONNECT UTILITIES (SPRING BREAK)	5 days	4/14/25	4/18/25
11	TEMPORARY SHORING AT REAR ENTRANCE (SPRING BREAK)	5 days	4/14/25	4/18/25
12	INSTALL TEMPORARY WALLS & EGRESS (SPRING BREAK)	5 days	4/14/25	4/18/25
13	FOOTINGS, FOUNDATIONS, SUPPORT OF EXCAVATION	74 days	4/18/25	7/30/25
14	STEEL ERECTION	22 days	7/30/25	8/28/25
15	SLAB & ROOF INSTALLATION	22 days	8/28/25	9/26/25
16	EXTERIOR WALLS	27 days	9/26/25	11/3/25
17	ENCLOSE EXTERIOR	0 days	11/3/25	11/3/25
18	**TEMPORARY HEAT (REFER TO SPECIFICATIONS)*	*120 days*	*11/4/25*	*4/20/26*
19	EXTERIOR MASONRY (COLD WEATHER PROCEDURES)	98 days	11/4/25	3/19/26
20	FRAME INTERIOR WALLS	25 days	11/4/25	12/8/25
21	MEP ROUGH-IN	45 days	12/9/25	2/9/26
22	INSTALL DOOR FRAMES	22 days	12/9/25	1/7/26
23	INSULATE & SHEET ROCK	20 days	2/10/26	3/9/26
24	TAPE & PRIME	24 days	3/9/26	4/9/26
25	INSTALL WINDOWS	33 days	3/9/26	4/22/26
26	FLOORING PREPARATION	20 days	4/9/26	5/6/26
27	DOORS & HARDWARE INSTALLATION	15 days	4/10/26	4/30/26
28	CEILING GRID INSTALLATION	22 days	4/10/26	5/11/26
29	MEP FINISHES	25 days	5/12/26	6/15/26
30	EXTERIOR SITEWORK, DRIVEWAY & PAVEMENT	67 days	3/20/26	6/22/26
31	KITCHEN FLOORING INSTALLATION	10 days	5/7/26	5/20/26
32	KITCHEN EQUIPMENT INSTALLATION	9 days	5/21/26	6/2/26
33	STAGE & CAFETERIA SPECIALTIES INSTALLATION	22 days	5/7/26	6/5/26
34	INSTALL CEILING TILE (WHITE-OUT)	25 days	6/16/26	7/20/26
35	INSTALL FLOORING	22 days	7/21/26	8/19/26
36	MEP COMMISSIONING & 'OFF-GASSING' PERIOD	15 days	8/20/26	9/9/26
37	FURNITURE INSTALLATION	12 days	8/20/26	9/4/26
38	IT COMMISSIONING	25 days	8/20/26	9/23/26



BREWSTER CENTRAL SCHOOL DISTRICT
Project: CV STARR IS CAFETORIUM ADDITION & ALTERATIONS
Date: 12/9/2024

Task — Milestone — Project Summary
Split — Summary — Progress

ID	Task Name	Duration	Start	Finish
39	LIFE & SAFETY COMMISSIONING & SIGNOFF	10 days	9/10/26	9/23/26
40	DEMOBILIZATION	5 days	9/24/26	9/30/26
41	FINAL CLEANING	5 days	9/24/26	9/30/26
42	**SUBSTANTIAL COMPLETION OF CAFETORIUM**	**0 days**	**10/1/26**	**10/1/26**
43	**PUNCH LIST & CLOSEOUT**	**42 days**	**10/2/26**	**11/30/26**
44	PUNCH LIST	21 days	10/2/26	10/30/26
45	CLOSEOUT	42 days	10/2/26	11/30/26
46	**INTERIOR RENOVATIONS & RELATED WORK**	**86 days**	**10/2/26**	**1/29/27**
47	**CONSTRUCTION | ALTERATIONS (EXISITING CAFETERIA)**	**65 days**	**10/2/26**	**12/31/26**
48	MOBILIZATION, TEMPORARY WALLS & EGRESS	3 days	10/2/26	10/6/26
49	DEMOLITION (ALL PRIMES)	5 days	10/7/26	10/13/26
50	FRAMING OF WALLS/ SOFFITS/CEILINGS	6 days	10/14/26	10/21/26
51	MEP ROUGH-IN	15 days	10/22/26	11/11/26
52	INSTALL DOOR FRAMES	3 days	10/22/26	10/26/26
53	INSULATE WALLS	4 days	11/12/26	11/17/26
54	SHEETROCK	3 days	11/18/26	11/20/26
55	TAPE & PRIME	5 days	11/23/26	11/27/26
56	PREPARE FLOORING SUB-BASE	2 days	11/30/26	12/1/26
57	HANG DOORS & HARDWARE	2 days	11/23/26	11/24/26
58	INSTALL STOREFRONT/GLAZING	5 days	12/2/26	12/8/26
59	INSTALL OPERABLE PARTITIONS	3 days	12/2/26	12/4/26
60	CEILING GRID INSTALLATION	4 days	11/30/26	12/3/26
61	MEP FINISHES	3 days	12/4/26	12/8/26
62	WHITE-OUT CEILING	2 days	12/9/26	12/10/26
63	INSTALL FLOORING FINISHES	5 days	12/11/26	12/17/26
64	FURNITURE INSTALLATION	3 days	12/18/26	12/22/26
65	IT COMMISSIONING	5 days	12/18/26	12/24/26
66	LIFE & SAFETY COMMISSIONING & SIGNOFF	5 days	12/18/26	12/24/26
67	DEMOBILIZATION	3 days	12/25/26	12/29/26
68	FINAL CLEANING	2 days	12/30/26	12/31/26
69	**SUBSTANTIAL COMPLETION OF RENOVATIONS & RELATED WORK**	**0 days**	**12/31/26**	**12/31/26**
70	**PUNCH LIST & CLOSEOUT**	**21 days**	**1/1/27**	**1/29/27**
71	PUNCH LIST	21 days	1/1/27	1/29/27
72	CLOSEOUT	21 days	1/1/27	1/29/27



BREWSTER CENTRAL SCHOOL DISTRICT
Project: CV STARR IS CAFETORIUM ADDITION & ALTERATIONS
Date: 12/9/2024

Task — Milestone — Project Summary
Split — Summary — Progress

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Change procedures.

C. Procedures for preparation and submittal of application for final payment.

1.3 RELATED REQUIREMENTS

A. Section 00 5200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.

B. Section 00 7200 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.

C. Section 01 2100 - Allowances: Payment procedures relating to allowances.

D. Section 01 2300 - Alternates: Payment procedures relating to alternates.

E. Section 01 7800 - Closeout Submittals: Project record documents.

1.4 SCHEDULE OF VALUES

A. Form to be used: AIA G732/703.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample, in PDF format to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify bonds and sub-contractors.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

G. Provide a separate line item for the following: (where applicable)

1. Bonds. (Bond premium may be paid when invoice of premium is provided).
2. OCP. (Policy premium may be paid when invoice of premium is provided).
3. Labor and materials, when payment is anticipated for material not installed
4. Submittals. (1% Minimum of contract amount)
5. Each allowance.
6. Each alternate.
7. Meeting attendance. (2% Minimum of contract amount)
8. As-built Drawings. (2% Minimum of contract amount)
9. Testing: HVAC balance reports (5% Minimum of contract amount)
10. Testing: General Construction, Plumbing and Electrical (2% Minimum of contract amount.)
11. Punch List (1% Minimum of contract amount).
12. Final Cleaning
13. Closeout Documents (3% Minimum of contract amount)
14. Identify line items being performed by subcontractors.
15. Authorized change orders.

1.5 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G732 and Form AIA G703, edition stipulated in the Agreement.

C. Forms filled out by hand will not be accepted.

D. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Value.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

H. Submit one (1) electronic "pencil copy", in PDF format, of each Application for Payment to Architect and Construction Manager for approval.

I. After Construction Manager's approval of the "pencil copy", CM shall submit a hard copy to the Architect for review and comment if required or approval. If approved architect shall release to the contractor, copy to CM.

J. No not submit for payment work that is projected beyond the date of the approved pencil requisition.

K. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3216.
   3. Partial Waivers of Mechanic's Lien: With each Application for Payment, submit partial waivers of mechanic's liens from contractor, subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
      a. Waiver Forms: Submit release of lien on forms, provided by the Architect 01 2005.
   4. When an application shows completion of an item, submit final or full waivers.
   5. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   6. Submit Final Application 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.
   7. Certified Payrolls; All Applications for Payment must be accompanied with certified payrolls for all Contract Work performed. **In addition each contractor and sub-contractor shall submit to the Owner within thirty days after issuance of its first payroll, and every thirty days thereafter**, a transcript of the original payroll record subscribed and affirmed as true under penalties of perjury. The Owners shall be required to receive and maintain such payroll records. The original payrolls or transcripts shall be preserved for three years from the completion of the work on the awarded project.

a. Submit certification that all personnel listed on certified payrolls have successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project.

L. Liens: No Payment will be made when a lien is filed against Owner by contractor or any subcontractor, or supplier or other entities until such lien is removed, bonded or similar action acceptable to the Owner

M. Project record documents as specified in Section 01 7800, shall be available for review by Brewster Central School District as a prerequisite for approval of payment.

N. Affidavits attesting to off-site stored products and insurance certificates covering all site material and equipment.

O. Payments for stored materials (whether on-site but not installed, or stored in secured warehouse) will require a Bill of Lading showing the exact value. In no case will more than 90% be approved if the item is not installed. Insurance certificates will be provided specific to materials stored (for on or off site items)

P. When Architect and Construction Manager requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

Q. The Architect and Owner shall retain Five (5) percent of the amount of each payment.

1.6 INITIAL APPLICATION FOR PAYMENT:

A. Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. Executed contract.
2. Approved bonds.
3. Approved insurance certificates.
4. Names of full time project manager, on site superintendent, and foreman. Refer to Article 11 of the General Provisions.
5. List of suppliers and fabricators: Refer to Section 01 1000 Summary of Contract(s) .
6. List of subcontractors: .
7. Approved Schedule of Values.
8. Contractor's Construction Schedule (preliminary if not final).
9. Contractor's Submittal Schedule.
10. Products list.

1.7 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Comply with Requirements of Section 01 7800 - Closeout Submittals.

1.8 MODIFICATION PROCEDURES

A. Refer to the General Provisions for additional information.

B. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.

C. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Construction Manager will issue instructions directly to the Contractor.

D. The Contractor shall be responsible for informing other in it's employ, subcontractor's whose work is affected by any modifications.

E. For other required changes, Architect will issue a document signed by Brewster Central School District instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
2. Promptly execute the change.
3. Refer to the General Provisionsfor additional information.

F. Architect and Construction Manager may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change shall prepare and submit a fixed price quotation within ten (10) days.

G. Contractor may propose a change by submitting a request for change to Architect and Construction Manager, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation . Document any requested substitutions in accordance with Section 01 2500

H. Computation of Change in Contract Amount: As specified in the Agreement and Provisions of the Contract.

I. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
   3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
      a. For Time and Material work Owner's representative shall verify time and material provided.

J. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

K. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

L. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

M. Promptly enter changes in Project Record Documents.

1.9 APPLICATIONS FOR PAYMENT WHEN BEHIND SCHEDULE

A. When the project falls behind schedule the contractor shall demonstrate the actions to be taken to put the project back on schedule.
   1. Payments will not approved until satisfactory evidence is presented to put the project on schedule.

1.10 APPLICATION FOR PAYMENT AFTER SCHEDULED COMPLETION DATE

A. In the event the work is not completed by the schedule date, listed in Section 01 1000 - Summary of Contracts, and in addition to the other remedies described, the Architect will not review progress payment requisitions submitted after the construction completion date, and the District will not issue any progress payments after that date, until all work is completed.
   1. Only one requisition for work performed, after the construction completion date, may be submitted, and it may be submitted only when all work is complete and a Punch List inspection is conducted; said requisition may be submitted when the work at 100% complete, less 5% retainage.

1.11 APPLICATION FOR FINAL PAYMENT

A. Comply with Section 01 7800

B. It is understood by the Contractor that the maximum payment due the contractor prior to final payment shall be Ninety (95%) of the Contract amount and the final Five (5%) will be due only after the completion and submittal of all requirements of Section 01 7800 - Closeout Submittals are met, including completion of all “punch list” items..

C. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7800 - Closeout Submittals are submitted and approved.
   2. All "punch list" items have been completed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2005
PARTIAL RELEASE OF LIEN

CONTRACTOR/SUBCONTRACTOR/VENDOR'S LETTERHEAD

Name of Facility: CV Starr Cafetorium Addition, Interior Renovation & Related Work

Name of Owner: Brewster Central School District

Address: 20 Farm to Market Road

Name of the Contractor/Subcontractor/Vendor: _____

Address: _____

Trade/Vendor:_____

Application # _____ Dated _____.

We certify that we have completed _____% of our Contract.

Prior to this requisition we have received payment equal to _____ % of of our contract amount.

The undersigned, upon receipt of the above requisition payment hereby releases and discharges the Owner of and from any liability or obligation in any way related to or arising out of this project up to and including the date of this document.

The undersigned further covenants and agrees that it shall not in any way claim or file a mechanic's or other lien against the premises of the above designated project, or any part thereof, or against any fund applicable thereto for any of the work, labor, materials heretofore furnished by it in connection with the improvement of said premises.

The undersigned further warrants that, in order to induce the Owner to release this partial payment, they have paid all claims for labor, material, .insurance, taxes, equipment, etc., employed in the prosecution of the work above, to date of this requisition.

The undersigned hereby releases and agrees to hold the Owner harmless from any and all claims in connection with the furnishing of such labor and materials, etc., for the construction of the aforementioned project.

The undersigned further guarantees that all portions of the work furnished .and/or provided by them are in accordance with the contract and that the terms of the contract with respect to these guarantees will hold for the period specified in said contract.

IN WITNESS WHEREOF, we have executed under seal this release on the above date and to be legally bound hereby:

WITNESS: _____FIRM: _____

BY: _____

_____

State of New York, County of _____ subscribed and sworn to before me this ____ day of _____ 202____

Notary public

My commission expires _____

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Contingency Allowances

B. Commissioning Allowance

1.3 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.4 CONTINGENCY ALLOWANCES

A. Contingency Allowances includes Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit and will be included in the Change Order(s) authorizing expenditure of funds from this Contingency Allowance.

B. Funds will be drawn from the Contingency Allowances only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

D. Contingency Allowances included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work and overhead and profit.

E. Contingency Allowances is an amount proposed by bidders, included on the Bid Form, as a cost per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if **additional work is required and not indicated or can be inferred by the Contract Documents** or requested to be added or deleted from the base bid. Contingency allowances listed on the Bid Form are to be included in the Total Bid Proposal.

F. Quantities indicated are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

G. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

1. Assist by providing necessary equipment, workers, and survey personnel as required.

H. Payment for Work governed by Contingency allowances will be made on the basis of the actual measurements and quantities of Work which is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit sum/price.

I. Payment will not be made for any of the following:

1. **Work performed prior to measurement and establishing quantities approved by Owner or Architect.**
2. Products wasted or disposed of in a manner that is not acceptable.
3. Products determined as unacceptable before or after placement.
4. Products placed beyond the lines and levels of the required Work.
5. Loading, hauling, and disposing of rejected products.

1.5 ALLOWANCES SCHEDULE

A. **COMMISSIONING ALLOWANCE - HVAC Contract # 3**

1. (HVAC -1) Costs Included in the Commissioning Allowances: Cost of an Commissioning Agent selected by the Owner to perform commissioning of the RTU, FANS and BMS##### as directed by LFG Engineers.
   a. **TOTAL COMMISSIONING ALLOWANCE HVAC Contract #3**
      (Insert on HVAC Bid Form) .
      TWENTY FIVE THOUSAND_____($ 25,000.00) DOLLARS

B. **CONTINGENCY ALLOWANCES - GC Contract #1**

1. GC- 1 Removal of Trench Rock:
   a. Description: Removal of trench rock off site and backfill resultant void.
   Unit of Measurement: Cubic Yard
   Quantity: ten cubic yards of trench rock including backfilling.
   Ten cubic yards @_$_____ per each yard:
   _____ ($_____) DOLLARS
2. GC-2 Removal of Mass Rock:
   a. Description: Removal of mass rock, backfill resultant void and disposed off site.
   Unit of Measurement: Cubic Yard
   Quantity: Ten cubic yards of mass rock including backfilling.
   Ten cubic yards @_$_____ per each yard:
   _____ ($_____) DOLLARS
3. GC- 3 Structural Fill (Select Fill):
   a. Description: Provide new structural fill.
   Unit of Measurement: Cubic Yard
   Quantity: One hundred cubic yards
   one hundred cubic yards @_$_____ per each yard:
   _____ ($_____) DOLLARS
4. GC- 4 Imported Compacted Fill:
   a. Description: Provide new imported compacted fill.
   Unit of Measurement: Cubic Yard
   Quantity: One hundred cubic yards
   one hundred cubic yards @_$_____ per each yard:
   _____ ($_____) DOLLARS

5. GC- 4 Removal and replacement of asphalt roadway:
   a. Description: Remove existing pavement and install new asphalt roadway pavement assembly.
   Unit of Measurement: square feet
   Quantity: five hundred square feet
   five hundred square feet @ $_____ per square foot:
   _____ ($_____) DOLLARS

6. GC - 5 Removal and replacement of asphalt sidewalk pavement assembly.
   a. Removal of existing pavement and install new asphalt sidewalk pavement assembly.
   Unit of Measure: Square feet
   Quantity: Five hundred square feet
   Five hundred square feet @_____ per square foot :
   _____ (_____) DOLLARS
7. GC-6 Removal and replacement of concrete sidewalk
   a. Description: Remove existing concrete pavement and install new concrete sidewalk pavement assembly.
   Unit of Measure: Square Feet
   Quantity: Five hundred square feet @ _____ per square foot:

_____($_____) DOLLARS

8. GC-7 Removal of existing curb and install new concrete curb.
   a. Description: Removal of existing curb and install new concrete curb assembly.
   Unit of Measure: Linear foot
   Quantity: Seventy five lineal feet @ _____per lineal foot:

   _____
   _____($_____) DOLLARS

9. GC- 8 Geo-textile Grid
   a. Description: New geo-textile grid.
   Unit of Measure: Square foot
   Quantity: Two hundred fifty square feet @ _____per square foot:

   _____
   _____($_____) DOLLARS

10. GC- 9 Clean crushed 3/4' stone.
   a. Description: Clean crushed 3/4" stone.
   Unit of Measure: Cubic Yard
   Quantity: Ten cubic yards @ _____per cubic yard:

   _____
   _____($_____) DOLLARS

11. GC -10 Unsuitable soil
   a. Description: Remove unsuitable soil and replace with compacted structural fill
   Unit of measure: Cubic yard
   b. Quantity: 50 cubic yards @ _____ per cubic yard

   _____
   _____($_____) DOLLARS

TOTAL CONTINGENCY ALLOWANCES CONTRACT #1 - (INSERT ON GC BID FORM)

_____
_____ ($) DOLLARS

(SUBMIT THIS COMPLETED FORM WITH BID DOCUMENTS)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Description of alternates for selection by the Owner, not included in the Base Bid.

1.3 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

B. Section 00 4100, 00 4110, and 00 4120 and 00 4130 Bid Forms for listing amount of each alternate.

C. Document 00 5200 - Agreement Form: Incorporating monetary value of accepted Alternates.

1.4 ACCEPTANCE OF Alternates

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Brewster Central School District's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.5 SCHEDULE OF ALTERNATES - CONTRACT #1 GENERAL CONSTRUCTION

A. Alternate No. GC-1: Connecting Corridor and SGI Classroom.

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material to install all work related to the construction of a Connecting Corridor,SGI Classroom and Storage Room in accordance with specifications and as shown on the contract drawings.

B. Alternate No. GC-2 :Elevator and Vestibule

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material for all work related to the construction of an Elevator and Vestibule in accordance with specifications and as shown on the contract drawings

C. Alternate No. GC-3 : Sight- Proof Louvers

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all labor, equipment and material required to install all work related to the construction of Sight-Proof Louvers and supports in accordance with the specifications and as shown on the contract drawings.

D. Alternate No. -GC-4 : Terrazzo Tile Floor in Cafetorium

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to to provide , furnish and install all labor, equipment and material required to install all work related to Terrazzo Tile Flooring in lieu of the specified Base Bid material,in accordance with the specifications and as shown on the contract drawings.

E. Alternate No. GC-5 - Glazed Block, polished ground face:

1. The Contractor for Contract #1 General Construction work shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all labor, equipment and material required to provide Glazed Block in accordance with specifications and as shown on the contract drawings

1.6 SCHEDULE OF ALTERNATES - CONTRACT #2 PLUMBING

A. Alternate No. PC-1: Connecting Corridor and SGI Classroom and Storage Rm.

1. The Contractor for Contract #2 Plumbing work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material to install all work related to

the plumbing of a Connecting Corridor , SGI Classroom and Storage Room in accordance with specifications and as shown on the contract drawings.

B. Alternate No. PC-2 :Elevator and Vestibule

1. The Contractor for Contract #2 Plumbing work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material to provide, furnish and install all work related to the plumbing of an Elevator and Vestibule in accordance with specifications and as shown on the contract drawings

1.7 SCHEDULE OF ALTERNATES - CONTRACT #3 HVAC

A. Alternate No. HC-1: Connecting Corridor, SGI Classroom and Storage Rm.

1. The Contractor for Contract #3 HVAC work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material related to the HVAC in the Connecting Corridor, SGI Classroom and Storage Room in accordance with specifications and as shown on the contract drawings.

B. Alternate No. HC-2 :Elevator and Vestibule

1. The Contractor for Contract #3 HVAC work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material to provide, furnish and install all work related to the HVAC of the Elevator and Vestibule in accordance with specifications and as shown on the contract drawings

1.8 SCHEDULE OF ALTERNATES - CONTRACT #4 ELECTRICAL

A. Alternate No. EC-1: Connectiting Corridor, SGI Classroom and Storage Room

1. The Contractor for Contract #4 Electrical work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material to install all work related to the Electricalwork in the Connecting Corridor, SGI Classroom and Storage Room in accordance with specifications and as shown on the contract drawings.

B. Alternate No. EC-2 :Elevator and Vestibule

1. The Contractor for Contract #4 Electrical work shall state the amount to be ADDED TO the Base Bid to to provide, furnish and install all labor, equipment and material for all work related to the Electrical of the Elevator and Vestibule in accordance with specifications and as shown on the contract drawings

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.3 RELATED REQUIREMENTS

A. Section 00 2113 - Instructions to Bidders: Restrictions on timing of substitution requests and System substitutions.

B. Section 01 2300 - Alternates, for product alternatives affecting this section.

C. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

D. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling and restrictions on timing of substitution requests.

E. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.4 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
2. Agrees to provide the same warranty for the substitution as for the specified product.
3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Brewster Central School District.
5. Waives claims for additional costs or time extension that may subsequently become apparent.
6. Agrees to reimburse Owner's Representative and Architect for review or redesign services associated with re-approval by authorities.
7. Statement indicating why specified material or product cannot be provided.
8. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
9. Samples, where applicable or requested.
10. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
11. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
12. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

13. 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 lack of availability or delays in delivery.
14. Cost information, including a proposal of change, if any, in the Contract Sum.
15. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
16. 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.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         a) Official project name and number, and any additional required identifiers established in Contract Documents.
      b. Substitution Request Information:
         a) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         b) Indication of whether the substitution is for cause or convenience.
         c) Issue date.
         d) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         e) Description of Substitution.
         f) Reason why the specified item cannot be provided.
         g) Differences between proposed substitution and specified item.
         h) Description of how proposed substitution affects other parts of work.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
         a) Physical characteristics.
         b) In-service performance.
         c) Expected durability.
         d) Visual effect.
         e) Sustainable design features.
         f) Warranties.
         g) Other salient features and requirements.
         h) Include, as appropriate or requested, the following types of documentation:
            (a) Product Data:
            (b) Samples: Provide full size actual sample of item proposed for substitution. Sample shall be provided, without exception, even if the originally specified item did not require a sample.
            (c) Certificates, test, reports or similar qualification data.
            (d) Drawings, when required to show impact on adjacent construction elements.
      d. Impact of Substitution:
         a) Savings to Brewster Central School District for accepting substitution.
         b) Change to Contract Time due to accepting substitution.
   2. Limit each request to a single proposed substitution item.

a. Submit an electronic document, combining the request form with supporting data into single document.
b. Deliver sample to Architect.

3.2 SUBSTITUTION PROCEDURES AFTER AWARD OF CONTRACT

A. Submittal Form:
1. Submit substitution requests by completing the form attached to this section. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Architect will consider requests for substitutions only within 15 days after date established in Notice to Proceed.

C. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.3 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

C. The Architects decision is final and binding.

3.4 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.5 ATTACHMENTS

A. A facsimile of the Substitution Request Form (During Construction) required to be used on the Project is included after this section.

SUBSTITUTION REQUEST FORM

SUBSTITUTION REQUEST No. _____

(After the Bidding Phase)

Project: CV Starr Cafetorium Addition, Interior Renovation & Related Work

Substitution Request Number: _____

From: _____

Date: _____

A/E Project Number: 23505.02

Contract For: _____

Specification Title: _____Description: _____

Section:_____ Page:_____ Article/Paragraph: _____

Proposed Substitution:

Manufacturer: _____ Address: _____ Phone:_____

_____model no.: _____

Installer:_____ Address: _____ Phone: _____

History: _____New product _____2-5 years old _____ 5-10 yrs old _____ More than 10 years old

Differences between proposed substitution and specified product:

_____

Point-by-point comparative data attached - REQUIRED

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____

Address:_____ Owner: _____

Date Installed: _____

Proposed substitution affects other parts of Work: ____ No ____Yes; explain

_____

Savings to Owner for accepting substitution: _____ ($)

Proposed substitution changes Contract Time: ____ No ____ Yes Add _____Deduct _____days.

Supporting Data Attached: ____ Drawings ____ Product Data ____ Samples _____ Tests Reports

The Undersigned certifies:

Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.

Same warranty will be furnished for proposed substitution as for specified product.

Same maintenance service and source of replacement parts, as applicable, is available.

Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.

Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.

Proposed substitution does not affect dimensions and functional clearances.

Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments:

A/E's REVIEW AND ACTION

____ Substitution approved - Make submittals in accordance with Specification Section 01330

____ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.

____ Substitution rejected - Use specified materials.

____ Substitution Request received too late - Use specified materials.

:_____Date:_____

Additional Comments: __ Contractor __ Subcontractor __ Supplier __ Manufacturer __ A/E

_____

_____

_____

_____

_____

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Progress meetings.

E. Contractor's daily reports.

F. Coordination drawings.

G. Submittals for review and information.

H. Number of copies of submittals.

I. Requests for Interpretation (RFI) procedures.

J. Submittal procedures.

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Duties of the Construction Manager.

B. Section 01 1000 - Summary of Contracts: Sequence of Work, Work covered by each contract occupancy, .

C. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

D. Section 01 6000 - Product Requirements: General product requirements.

E. Section 01 3553 - Site Safety and Security Procedures.

F. Section 01 5000 - Temporary Facilities and Controls.

G. Section 01 7000 - Execution: Additional coordination requirements.

H. Section 01 7800 - Closeout Submittals.

I. Section 01 9113 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.

1. Where submittals are indicated for review by both Architect, Construction Manager, and Commissioning Authority submit one extra and route to Architect and Construction Manager first, be for forwarding to the Owner's Representative and Commissioning Authority.
2. Where submittals are not indicated to be reviewed by Architect, submit directly to the Construction Manager and Commissioning Authority; otherwise, the procedures specified in this section apply to commissioning submittals.

1.4 REFERENCE STANDARDS

A. Submittal Cover Sheet: Attached at the end of this section.

1.5 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect and Construction Manager:

1. Requests for Interpretation (RFI).

2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

1.6 PROJECT COORDINATION

A. Owner's Representative: Construction Manager: Triton Construction Co..
   1. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings. Prepare similar memoranda for the Architect and Construction Manager and separate contractors where coordination of their work is required.

B. Each Contractor shall:
   1. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
      a. Preparation of schedules.
      b. Installation and removal of temporary facilities.
      c. Processing of submittals and photocopying/delivery to affected contractors.
      d. Progress meetings.
      e. Project closeout activities.
   2. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.
   3. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.
   4. 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.
      a. Coordinate installation of different components with other contractors and/or subcontractors to ensure maximum accessibility for required maintenance, service, and repair
   5. Each shall cooperate with the Construction Manager in allocation of mobilization areas of site, access, traffic, parking facilities, field offices, and sheds.
   6. During construction, coordinate use of site and facilities through the Project Coordinator.
   7. Comply with Construction Manager's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
   8. Comply with instructions of the Construction Manager's for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary of Contracts.

9. Coordinate field engineering and layout work under instructions of the Construction Manager.

C. Make the following types of submittals to Architect and Construction Manager
1. Requests for Interpretation.
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
2. Each Contractor and Architect and Construction Manager are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, and Construction Manager and Architect's consultants will be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:
1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Construction Manager and Architect and Contractor participating; further training is the responsibility of the user of the service.

D. Project Closeout: Architect and Construction Manager will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Brewster Central School District.

3.2 PRECONSTRUCTION MEETING

A. Construction Manager will schedule a meeting after Notice of Award.

B. Attendance Required:
1. Brewster Central School District.

2. Architect
3. Consultants.
4. Construction Manager
5. All contractors.
6. Contractor's Field Superintendent.

C. Agenda:
1. Execution of Brewster Central School District-Contractor Agreement.
2. Submission of executed Bonds and Insurance certificates..
3. Distribution of Contract Documents.
4. Submission of schedule of values, progress schedule, list of products,, and list of subcontractors,
5. Designation of personnel representing the parties to Contract.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Review construction scheduling.
8. Use of premises by Owner and Construction Manager and Prime Contractors.
9. Brewster Central School District's requirements and occupancy prior to completion.
10. Construction facilities and controls provided by Brewster Central School District.
11. Temporary utilities provided by Brewster Central School District.
12. Survey existing facilities prior to starting construction.
13. Security and housekeeping procedures.

D. Construction Manager will record minutes and distribute copies within five days after meeting to all participants. Contactor shall distribute to all entities of the Contractor affected by decisions made.

3.3 SITE MOBILIZATION MEETING

A. Construction Manager will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
1. All Prime Contractors.
2. Brewster Central School District.
3. Architect.
4. Contractor's Superintendent.
5. Major subcontractors.

C. Agenda:
1. Use of premises by Brewster Central School District and Contractor.
2. Brewster Central School District's requirements.
3. Construction facilities and controls provided by Brewster Central School District.
4. Temporary utilities provided by Brewster Central School District.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

D. Construction Manager will record minutes and distribute copies within five after meeting to all participants. Contactor shall distribute to all entities of the Contractor affected by decisions made.

3.4 PROGRESS MEETINGS

A. Construction Manager will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Meetings will be scheduled throughout progress of the Work at minimum of two week intervals.

C. Attendance Required:
   1. Brewster Central School District.
   2. Architect
   3. Construction Manager
   4. Contractors.
   5. Special consultants.
   6. Contractor's superintendent.
   7. Major Subcontractors.
   8. Suppliers as appropriate to agenda topics for each meeting.

D. Attendees: In addition to representatives of the Owner, Architect/Engineer, and Construction Manager, each Prime Contractor shall be represented at these meetings.
   1. Attendance is mandatory at each meeting and a penalty sum of $500.00 per missed meeting will be assessed to the Prime Contractor not attending without prior written authorization from the Construction Manager. Subcontractors, suppliers, or other entities will be invited at the discretion of the Construction Manager and Architect. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the work
   2. Subcontractors, suppliers, or other entities will be invited at the discretion of the Construction Manager.
   3. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work

E. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of delivery schedules.
   7. Review construction safety programs.
   8. Review exiting and separation of construction
   9. Maintenance of progress schedule.
   10. Corrective measures to regain projected schedules.
   11. Planned progress during succeeding work period.
   12. Coordination of projected progress.
   13. Maintenance of quality and work standards.
   14. Effect of proposed changes on progress schedule and coordination.
   15. Other business relating to work.

F. Construction Manager will record minutes and distribute copies within five days after meeting to all participants. Contactor shall distribute to all entities of the Contractor affected by decisions made.

3.5 WEEKLY COORDINATION MEETINGS

A. The Construction Manager shall schedule and hold weekly general project coordination meetings at regularly scheduled times that are convenient for the attendance of prime contractors and other parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Required attendance includes General Construction

Contractor, HVAC Contractor, Plumbing Contractor, and Electrical Contractor and every other entity identified by any prime contractor as being currently involved the coordination or planning for the work of the entire project. Conduct meetings in a manner that resolve coordination problems. The Contractor for General Construction Contractor shall preside at each meeting, and shall record meeting results. The General Construction Contractor shall distribute copies of the meeting result to everyone in attendance, the Architect and Construction Manager and to others affected by the decisions and actions resulting from each meeting.

1. Each Contractor review with the Construction Manager the work schedule for the week in order to insure the planned work does not conflict with facility operations.

3.6 CONSTRUCTION PROGRESS SCHEDULE - See Section 01 3216

3.7 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. Transmit reports electronically Architect and Construction Manager at weekly intervals.

C. Each Contractor shall prepare a daily construction report recording the following information concerning events at Project site and project progress:

1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. Major equipment at Project site.
5. Material deliveries.
6. Safety, environmental, or industrial relations incidents.
7. Meetings and significant decisions.
8. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
9. Testing and/or inspections performed.
10. Signature of Contractor's authorized representative.

3.8 PROOF OF ORDERS AND DELIVERY DATES

A. Within two (2) weeks after the approval of shop drawings, samples, product data and the like, the Contractor(s) shall provide copies of purchase orders for all equipment and materials which are not readily available in local stock. The Contractor(s) shall submit written statements from suppliers confirming the orders and stating promised delivery dates. Dates shall be indicated and coordinated with the Construction Schedule.

3.9 COORDINATION AND COORDINATION DRAWINGS

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.

B. All primes shall provide information required by other primes for preparation of coordination drawings required by a prime contractor.

1. All roofing work must be performed by roofing sub-contractors approved by the roofing manufacturer in insure roofing warranty is maintained.

C. Provide information required by Architect and Construction Manager for preparation of coordination drawings including:

1. Review drawings prior to submission to Architect and Construction Manager .

2. Indicate all HVAC equipment, ductwork, and major piping, including elevations and dimensions to all fixed building elements, such as beams; columns; slabs; ceilings, including ceiling suspension; framing; floors; walls; doors, including door swings; and windows affected by the equipment, ductwork, and piping.
3. Indicate all existing and proposed lighting fixtures, smoke detectors, and sprinkler heads.
4. Show location of all valves, dampers (fire, smoke, volume, and automatic), coils, humidifiers, smoke detectors, etc. requiring access for service and maintenance.
5. Show all registers, grilles, diffusers, radiators and convectors, and other terminal elements.
6. Locate all access doors.
7. Include large-scale details and sections as required to fully delineate the conditions in congested areas, leaving space for the work of the other trades.
8. Show plan layout of all equipment and anchoage and fasteners
9. The entirety of submitted drawings and data shall be clearly legible. If any portion of the submitted drawing is unclear it shall be resubmitted in completely clear form.

3.10 SPECIAL COORDINATION DRAWINGS (NOTE THAT REFERENCE TO CADD DRAWING ON CD SHALL MEAN TO PROVIDE CADD DRAWING ELECTRONICALLY. CD IS NOT REQUIRED)

A. Procedures for special coordination drawings shall be in accordance with paragraphs below:
   1. The Construction Contractor shall furnish sufficient experienced drafting and engineering personnel to prepare coordination drawings and participate in coordination meetings scheduled and directed by the Construction Manager. The Construction Contractor Contractor shall submit the coordination drawings of their trades within 15days from the date of the Letter of Award. Each of the other Contractors shall prepare their coordination drawings within ten days of receiving the coordination drawing "Set" from the previous contractor.
   2. Coordination drawings shall be completed and submitted for distribution in time so as not to delay the construction. The coordination drawings may lack complete data in certain instances pending receipt of shop drawings, but sufficient space shall be allotted for the items affected.
   3. The Construction Contractor shall initiate coordinating the installations for all the Contractors by means of coordination and sleeve drawings, as specified herein.
      a. The Construction Contractor shall prepare CADD drawing on CD indicating their equipment and appurtenances for each floor and phase, at not less than 3/8" scale. The drawings shall show beams, columns, ceiling grid and heights, walls/partitions, casework, floor to floor dimensions, floors, windows, door swings etc. that relates to the construction.
      b. The Construction Contractor shall deliver CADD drawing on CD to HVAC Contractor, with copy of transmittal to Architect and Construction Manager .
   4. The HVAC Contractor shall overlay on CADD drawing on CD, at a scale of 3/8" = 1'-0" showing all HVAC equipment, ductwork, and major piping, including elevations and dimensions to all fixed building elements, such as beams; columns; slabs; ceilings, including ceiling suspension; framing; floors; walls; doors, including door swings; and windows affected by the equipment, ductwork, and piping. Show all registers, grilles, diffusers, radiators and convectors, and other terminal elements Show location of all valves, dampers (fire, smoke, volume, and automatic), coils, humidifiers, smoke detectors, etc. requiring access for service and maintenance. Locate all access doors. Include large-scale details and sections as required to fully delineate the conditions in congested areas, leaving space for the work of the other contractors. Show plan layout of all equipment bases, pads, and inertia blocks. Clearly label all work by HVAC Contractor.
      a. HVAC Contractor shall deliver CADD drawings on CD to Plumbing Contractor, with copy of transmittal to Architect and Construction Manager. The Construction Contractor shall verify elevations and dimensions to all fixed building elements, such as beams; columns; slabs; ceilings, including ceiling suspension; framing; floors; walls; doors, including door swings; and windows

5. The Plumbing Contractor shall overlay on the mylar transparency coordination drawings prepared by the HVAC Contractor all water supply, drain, waste, vent, sprinkler main and branch piping, risers and sprinkler heads and other major lines. Indicate piping elevations and locations of fire hose cabinets, drinking fountains, etc. which encroach on duct shafts. Locate valves and other items requiring access for service and maintenance. Locate all access doors. Avoid interference with HVAC work and with building construction. Use same scale as drawing being overlaid. Clearly label all work by Plumbing Contractor.
   a. Plumbing Contractor shall deliver mylar transparencies to Electrical Contractor with copy of transmittal to Architect and Construction Manager.
6. The Electrical Contractor shall overlay on CADD drawings on CD coordination drawings prepared by Construction and HVAC Contractors all main conduit and bus runs, cable trays, light fixtures, major equipment, and switch gear and panel boards. Show elevations and clearances. Show all items requiring access for service and maintenance. Locate all access doors. Avoid interference with HVAC work and with building construction. Use same scale as drawings being overlaid. Clearly label all work by Electrical Contractor
   a. Electrical Contractor shall deliver CADD drawings on CD to Construction Contractor with copy of transmittal to Architect and Construction Manager.
7. The Construction Contractor shall review and verify all beams, columns, ceiling grid and heights, walls/partitions, casework, floor to floor dimensions, floors, windows, door swings etc. that relates to the construction.
8. Each Contractor shall attend coordination meetings and participate as directed by Construction Manager to resolve interference and conflicts. All such coordination work is included in the contract responsibility of each involved contractor. When mutually agreed, make minor changes in ductwork, piping, or conduit routing or equipment location required to avoid space conflicts, but do not resize items or relocate exposed items without the Architect or Construction Manager's approval. Do not make changes in wall or chase locations, ceiling heights, door swings or locations, window or other openings, or other items affecting the function or aesthetic effect of the building. If conflicts or interference cannot be satisfactorily resolved with such minor changes, notify the Owner's Representative who shall obtain a decision from the Architect.
9. Each Contractor shall prepare coordination drawings without awaiting final product approval of terminal devices, outlets, fixtures, etc. Provide sufficient space for such items and re-coordinate as required when final product approval is obtained.
10. No preference or advantage shall be given to any contractor in considering solution of conflicts, or grant priority to any one contractor in the allocation of space. If the contractors are unable to reach an agreement on a matter on a matter of interference the matter shall be submitted to the Architect for his binding decision. Should any problems of coordination require architectural or structural changes of design, this change shall be submitted to the Architect for approval.
11. After the set has been coordinated and all necessary changes have been made, these drawings shall then by signed off by each of the contractors, indicating their awareness of and agreement with the indicated routings and layouts and their inter-relationship with the adjoining or contiguous work of all contracts Thereafter, no unauthorized deviations will be permitted and if made without the knowledge or agreement of the Architect and Owner's Representative or other affected contractors, will be subject to removal and correction at no additional cost to the Owner.
12. After final coordination and sleeve drawings have been agreed upon and signed by all contractors. The Construction Contractor shall provide and distribute copy in PDF format to each of the Prime Contractors, the Architect and Construction Manager for reference and record purposes. Contractors desiring additional copies of such drawings, beyond the basic distribution indicated above shall arrange and pay for cost of same.

B. Each contractor as a working reference shall retain the record copies of final coordination drawings. All shop drawings, prior to their submittal to the Architect shall be compared with the coordination drawings and developed accordingly by the contractor responsible. Any revisions to the coordination drawings,

which may become necessary during the progress of the work shall be noted by all Contractors and shall be neatly and accurately recorded on the record copies. Each Contractor shall be responsible for the up-to-date maintenance of their own record copies of the coordination drawings and keep one copy available at the site. Each Contractor and sub Contractors in the development of their “as-built” drawings thereto, shall utilize the coordination drawings and any subsequent changes. The Contractor(s) may not use coordination drawings for the submittal of ductwork.

C. NO EXTRA COMPENSATION will be paid to any contractor for relocating any duct, pipe, conduit, or other material installed without coordination among trades involved or among other affected contractors. Each Contractor who causes any additional work to other contractors by improperly coordinated work or work not installed in accordance with the signed coordination drawings shall reimburse the affected other contractors for the cost of the additional work.

D. All changes in the work on any contract, whether a change in price is given or not, shall be shown on the coordination drawings.

E. Coordination drawings shall not be used for “shop drawings” or "as-built" drawings except where approved by the Owner's Representative.

F. Upon completion of the project, the Construction Contractor shall turn over the original reproducible coordination drawings, plus 4 blue-line copies to the Owner's Representative.

3.11 REQUESTS FOR INTERPRETATION (RFI)

A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
   2. Prepare using software provided by the Electronic Document Submittal Service.

B. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section-01 2500 - Substitution Procedures)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   2. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
   3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response.

C. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.

D. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Brewster Central School District.

3.12 SUBMITTAL SCHEDULE

A. Submit to Architect and Construction Manager for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.

3. Format schedule to allow tracking of status of submittals throughout duration of construction.

3.13 SUBMITTALS FOR REVIEW

A. Refer to paragraph 3.1 for addition requirements and procedures.

B. All submittals are the product and the property of the Contractor. The Owner, Owner's Representative , Architect, Construction Manager, or Consultants shall not be responsible for the contractor's construction means, methods or techniques: safety precautions or programs; Acts or admissions; or failure to carry out the work in accordance to the contract documents

C. Shop Drawing Submittal Log no later than five (5) working days after award of contract.

D. All Shop Drawing Submittals shall be submitted no later than forty (40) calendar days after Letter of Award of Contract. No further payments will be made to the contractor after forty (40) until all submittals are made.

E. When the following are specified in individual sections, including but not limited to the following, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.
   5. Templates.
   6. Standard wiring diagrams.

F. Submit to Architect and Construction Manager for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

G. Samples will be reviewed only for aesthetic, color, or finish selection and for record documents purposes described in Section 01 7800 - Closeout Submittals.

H. After review, provide copies and distribute in accordance with Submittal Procedures article below .

I. The Architect shall review and approve or take other appropriate action on the Contractor submittals, such as shop drawings, product data, samples and other data, which the Contractor is required to submit, but only for the limited purpose of checking for conformance with the design concept and the information shown in the Construction Documents. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. The Architect's review shall be conducted with reasonable promptness while allowing sufficient time in the Architect's judgment to permit adequate review. Review of a specific item shall not indicate that the Architect has reviewed the entire assembly of which the item is a component. **The Architect shall not be responsible for any deviations from the Construction Documents not brought to the attention of the Architect, in writing, by the Contractor.** The Architect shall not be required to review partial submissions or those for which submissions of correlated items have not been received.

J. Marking or comments on shop drawings shall not be construed as relieving the Contractor from compliance with the contract project plans and specifications, nor departure therefrom. The contractor remains responsible for details and accuracy for conforming and correlating all quantities, verifying all dimensions, for selecting fabrication processes, for techniques of assembly and for performing their work satisfactorily and in a safe manner.

K. **Architect will review the original submittal and one (1) re submittal. Additional reviews will be additional services provided to the Owner and charged accordingly. The Owner will back charge the contractor accordingly.**

L. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

M. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

3.14 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Inspection reports.
   4. Manufacturer's instructions.
   5. Manufacturer's field reports.
   6. Other types indicated.

B. Submit for Construction Manager's knowledge as contract administrator. No action will be taken.

3.15 SUBMITTALS FOR PROJECT CLOSEOUT

A. Refer to Section 01 7800 - Closeout Submittals..

3.16 NUMBER OF COPIES OF SUBMITTALS

A. Documents: Submit one electronic copy **in PDF format**; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected. All submittals shall be in electronic format and conforming to the following:
   1. Each item shall be in a separate file.
   2. Each file name shall start with the specification section number and contain an abbreviated explanation of what it contains; for example:
      a. 08 5113 Aluminum Windows; 08 1613 Fiberglass Doors and Aluminum Frames; 08 8000 Glazing.
   3. Add Revision number (Rev2 Rev3, etc) to the file name when resubmitting items, for example:
      a. 07 5323 EPDM Rev l.pdf 07 5323 Bond AdhRev l.pdf
   4. Provide a Cover Sheet with each item - in the same file as the technical submittal.
   5. Do not zip the files, and do not put the files in Folders.
   6. Make all technical submittals at one time per trade- refer to the specification for additional submittal requirements for example:
      a. Concrete; Masonry; Miscellaneous Fabrications; Roofing; etc.
   7. Do not send MSDS with the technical submittals; collate all of the MSDS needed for the entire project in three ring binders, organized by specification section, and submit the binders to the Construction Manager, with copy of Transmittal to the Architect, and maintain one copy at the project site.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Construction Manager.
   1. After review, produce duplicates.
   2. Approved sample will be retained at the project site.
   3. Retained samples will not be returned to Contractor unless specifically so stated.
   4. Submit with each sample, in electronic PDF format, data, cuts, photos, color, charts, etc.

3.17 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Refer to paragraph 3.1 for additional requirements.
   2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   3. Transmit using approved form attached to this section.

4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
   a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   b. All submitted shop drawings shall be stamped and signed by the Contractor with the following note:
      a) "We the undersigned certify that we have reviewed and coordinated this shop drawing and they are in conformance to the plans, specifications, applicable codes and other provisions of the Contract Documents."
7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
   a. Send submittals in electronic format via email to Architect and Construction Manager.
8. Schedule submittals to expedite the Project, and coordinate submission of related items.
   a. For each submittal for review, allow 10 working days excluding delivery time to and from the Contractor.
   b. For sequential reviews involving Architect and Construction Manager or another affected party, allow an additional 7 days.
9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
10. Provide space for Contractor and Architect and Construction Manager review stamps.
11. When revised for resubmission, identify all changes made since previous submission.
12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
14. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Do not reproduce Contract Documents to create shop drawings.
   3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
   1. Transmit related items together as single package.
   2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.18 SUBMITTAL REVIEW

A. Submittals for Review: Architect and Construction Manager will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect and Construction Manager will acknowledge receipt, but will take no other action.

C. Architect and Construction Manager's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and his consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved", or language with same legal meaning.
      b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
      c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
   2. Not Authorizing fabrication, delivery, and installation:
      a. "Revise and Resubmit".
         a) Resubmit revised item, with review notations acknowledged and incorporated.
      b. "Rejected".
         a) Submit item complying with requirements of Contract Documents.

E. Architect's and his consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

3.19 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. General: Except for submittals for the record and similar purposes, where action and return on submittals is required or requested, the Architect/Engineer will review each submittal, mark with appropriate "Action".

C. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

D. Final Unrestricted Release: Where the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.
   1. Marking: "No Exceptions Taken"

E. Final-But-Restricted Release: When the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with both the Architect's/Engineer's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.
   1. Markings: "Make Correction Noted"

F. Returned for Re-submittal: When the submittal is marked as follows, do not proceed with the work covered by the submittal, including purchasing fabrication, delivery or other activity. Revise the submittal or prepare a new submittal in accordance with the Architect's/Engineer's notations stating the reasons for returning the submittal; resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the following marking to be used at the project site, or elsewhere where work is in progress.
   1. Marking: "Revise and Resubmit"

G. Marking: "Rejected".

H. Other Action: Where the submittal is returned, marked with the Architect/Engineer's explanation, for special processing or other Contractor activity, or is primarily for information or record purposes, the submittal will not be marked.

SUBMITTAL COVERSHEET

Brewster Central School District

CV Starr Cafetorium Addition, Interior Renovation & Related Work

CV Starr Intermediate School

ARCHITECT:	**CONSTRUCTION MANAGER:**	**OWNER:**
Architect	**Triton Construction**	**Brewster Central School District**
45 Knollwood Rd.	**1279 Route 300**	**30 Farm To Market Road.**
Elmsford, NY10523	**Newburgh, New York 12550**	**Brewster, New York 10509**

CONTRACTOR: _____ CONTRACT: _____

ADDRESS: _____

DATE _____TELEPHONE: _____EMAIL: _____

Facility Name: CV Starr Intermediate School

Type of Submittal: Re-submittal: [ ] No [ ] Yes

[ ] Shop Drawings [ ] Product Data [ ] Schedule [ ] Sample

[ ] Test Report [ ] Certificate [ ] Color Sample [ ] Warranty

SUBMITTAL DESCRIPTION: _____

PRODUCT NAME: _____

MANUFACTURER: _____

SUBCONTRACTOR/_____

SUPPLIER: _____

SPEC. SECTION NO.: _____ DRAWING NO(S): _____

PARAGRAPH: _____ RM. OR DETAIL NO(S): _____

CONTRACTOR'S REVIEW STAMP

Contractor Review Statement: These documents have been checked for accuracy and coordinated with job conditions and Contract requirements by this office and have been found to comply with the provisions of the Contract documents.

Remarks:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

NAME: _____ DATE: _____

END OF SECTION

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

C. Master Schedule.

1.3 RELATED SECTIONS

A. Section 01 1000 - Summary of Contracts: Work sequence.

B. Section 01 1010 - Milestone Schedule.

C. Section 01 3000 - Administrative Requirements.

D. Reference drawing - Site Safety Plan.

E. Phasing Drawing.

1.4 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

1.5 RESPONSIBILITY

A. The General Construction Contractor Contract #1 shall, within 30 days after contract award, be responsible for preparing and updating a **master progress schedule for all contracts.**

1. Each Contractor shall develop a full schedule, in sufficient detail and clarity of form and technique so that the General Construction Contractor can plan and control his work properly and the Construction Manager can readily monitor and follow the progress for all portions of the work. Each Contractorr shall complete the detailed schedule within 10 days after Letter of Award.
    a. Identify all long lead items and dates required on site.
    b. In the event of conflict Construction Manager shall resolve and provide direction which is in the best interest on the District.
2. Each Contractor shall coordinate their work with work of all prime contractors.
3. The General Construction Contractor shall prepare a **draft master schedule** within 10 days after receiving schedules from each prime contractor and distribute to all prime contactors, Architect and Construction Manager
4. Within 5 days after receiving draft master schedule all prime contractors shall meet to revise, (if required) and sign off on the master schedule.
    a. In the event of conflicts the Construction Manager shall resolve and provide direction which is in the best interest on the District.
5. The General Construction Contractor Contract #1 shall be responsible for incorporating all final revision, schedules, of all prime contractors, and prepare a **full final master schedule,** and updates, as required or directed by the Construction Manager.

B. General Construction Contractor Contract #1 shall coordinate their work with work of all prime contracts.

C. The activities identified in the schedule shall be analyzed in detail to determine activity time durations in units of whole working days. All duration's shall be the result of definitive manpower and resource planning by the Contractor.

D. The activity data shall include activity codes to facilitate selection, sorting and preparation of summary reports and graphics. Activity codes shall be developed for:

1. Area: Subdivision of the building(s) and/or site(s) into logical modules or blocks and levels. Pods A, B, C and D, etc.
2. Contractor or subcontractor responsible for the work.
3. Specifications: 16 Division CSI format.
4. System: Division of the work into building systems for summary purposes.
5. Milestone: Work associated with completion of interim completion dates or milestones
6. Pay Item: Work identified with a pay item on the Schedule of Values.

1.6 SUBMITTALS

A. Within 10 days after date Letter of Award, each prime Contractor shall submit preliminary schedule to the General Construction Contractor with copies to the Construction Manager.

B. Within ten (10) days after receipt of each preliminary schedule, the General Construction Contractor shall develope the Master Schedule and distribute to each prime contractor.

C. If preliminary Master Schedule requires revision after review, submit revised schedule within 5 days with copies to the Construction Manager.

D. Within 5 days after review of Master Schedule, submit final of the complete schedule for approval.
   1. Include written certification that all prime Contractors have reviewed and accepted proposed schedule.

E. Submit updated master schedule with each Application for Payment.

F. When requested by the Construction Manager submit when project fall behind schedule.

G. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements.

H. The Contractor(s) are hereby notified that payment requisitions will not be processed by the Architect and Construction Manager, nor paid by the Owner, until all schedules are reviewed, updated and approved by each prime contractor Architect and Construction Manager and Master Schedule revised.

1.7 QUALITY ASSURANCE

A. Scheduler: Contractor 's personnel or specialist Consultant specializing in construction scheduling with three (3) years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: 3 years minimum experience in using and monitoring Bar Chart schedules on comparable projects.

1.8 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each building and each activity. Identify each activity with the applicable specification section number.

B. Submit schedule in electronic PDF format.

C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a preliminary network diagram.

B. Based on the preliminary development of the progress schedule and on feedback from Architect and Construction Manager or whatever updating may have occurred during the project start-up, the General Construction Contractor shall, for the entire work of of all the prime contracts, , prepare the (Master Schedule), secure critical time commitments for performing major elements of all the work.

3.2 GENERAL CONTENT

A. Milestones: Include milestones in schedule, including, but not limited to, Notice of Award, Submittals, Verification of existing conditions, Asbestos/Lead Abatement, Removals, Delivery of Major Equiment, such as HVAC Units, Fans, Motors, Installation, Substantial Completion, Completion of Punch List, Final Completion, and Closeout

B. Show complete sequence of construction by phase, activity, by room with dates for beginning and completion of each element of construction.

C. Identify each item by specification section number.

D. Identify work of Addition and other logically grouped activities.

E. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary of Contracts.

F. Include conferences and meetings in schedule.

G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect and Construction Manager. Indicate decision dates for selection of finishes.

I. Indicate delivery dates for products identified under Allowances and products identified under Alternates.

J. Provide legend for symbols and abbreviations used.

3.3 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
   1. Preceding and following event numbers.
   2. Activity description.
   3. Estimated duration of activity, in maximum 15 day intervals.
   4. Earliest start date.
   5. Earliest finish date.
   6. Actual start date.
   7. Actual finish date.
   8. Latest start date.
   9. Latest finish date.
   10. Total and free float; float time shall accrue to Brewster Central School District and to Brewster Central School District's benefit.
   11. Percentage of activity completed.
   12. Responsibility.

D. Analysis Program: Capable of accepting revised completion dates, and recomputation of all dates and float.

E. Required Reports: List activities in sorts or groups:
   1. By preceding work item or event number from lowest to highest.
   2. By amount of float, then in order of early start.

3.4 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Construction Manager at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, the Master Schedule and resubmit within 5 days.
   1. When project work is behind schedule indicate revisions required to put the project on schedule.
   2. Payments will not be approved until satisfactory evidence is presented, by the Contractor(s) behind schedule, to put the project on schedule.

3.5 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.6 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Fuller and D'Angelo, P.C., Construction Manager, other Prime Contractors, subcontractors, major suppliers, and Contractor's site files and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

3.7 CHANGES, DELAYS AND EXTENSIONS OF TIME

A. When changes or delays are experienced, each Contractor shall submit to the Construction Manager a Time Impact Analysis illustrating the influence of each change or delay on the current Contract scheduled completion date. Each time analysis shall include a Fragment (network analysis) demonstrating how the Contractor proposed to incorporate the change or delay into the Detailed Schedule.
   1. Each time analysis shall include a Fragment (network analysis) demonstrating how the Contractor proposed to incorporate the change or delay into the Detailed Schedule.
   2. The analysis shall demonstrate the time impact based on the date the change was given to the Contractor, the status of construction at that point in time, and the activity duration of all effected activities.
   3. The activity duration used in this analysis shall be those included in the latest update of the Detailed Schedule, closest to the time of delay or as adjusted by mutual agreement.

B. Each Time Impact Analysis shall be submitted within ten (10) calendar days after a delay occurs or a notice of change order is given to the Contractor. In cases where the Contractor does not submit a Time Impact Analysis for a specific change or delay with a specified period of time, it shall be mutually agreed that no time extension is required. Final evaluation of each Time Impact Analysis by the Construction Manager shall be made within fourteen (14) calendar days after receipt unless subsequent meetings and negotiations are necessary. Adjustments in the Contract time for performance shall be made only by written change order approved by the Owner. Upon approval of the Owner, Fragments illustrating the influence of changes and delays shall be incorporated into the Detailed Schedule by the contractor during the first update after agreement is reached.

END OF SECTION

SECTION 01 3306
NON-DISCRIMINATION CLAUSES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 REQUIREMENTS

A. During the performance of this contract, the contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color or national origin, and will take affirmative action to insure that they are afforded equal employment opportunities without discrimination because of race, creed, color or national origin. Such action shall be taken with reference, but not be limited, to: recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on-the job training.
2. The contractor will send to each labor union or representative of workers with which he has or is bound by a collective bargaining or other agreement or understanding, a notice, to be provided by the State Commission for Human Rights, advising such labor union or representative of the contractor's agreement under these clauses hereinafter called "non-discrimination clauses" and requesting such labor union or representative to agree in writing, standing or otherwise, that such labor union or representative will not discriminate against any member or applicant for membership because of race, creed, color or natural origin. Such action shall be taken with reference, but not limited, to: recruitment, employment job assignment, promotion, upgrading, demotion, transfer, layoff, or termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on-the-job training. Such notice shall be given by the Contractor, and such written agreement shall be made by such labor union or representative, prior to the commencement of performance of this contract. If such labor union or representative fails or refuses so to agree in writing the Contractor shall promptly notify the State Commission of Human Rights of such failure or refusal.
3. The Contractor will post and keep posted in conspicuous places, available to employees and applicants for employment, notices to be provided by the State Commission for Human Rights setting forth the substance of the provisions of clauses and such provisions of the State's laws against discrimination as the State Commission for Human Rights shall determine.
4. The Contractor will state, in all solicitation or advertisements for employees placed by or on behalf of the contractor, that all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color or national origin.
5. The Contractor will comply with the provisions of Section 291-299 of the Executive Law and the Civil Rights Law, will furnish all information and reports deemed necessary by the State Commission for Human Rights under these non-discrimination clauses and such sections of the Executive Law, and will permit access to his books, records and accounts by the State Commission for Human Rights, the Attorney General and the Industrial Commissioner for purposes of investigation to ascertain compliance with these non-discrimination clauses and such sections of the Executive Law and Civil Rights Law.
6. This contract may be forthwith canceled, terminated or suspended, in whole or in part by the Owner upon the basis of a finding made by the State Commission for Human Rights that the contractor has not complied with these nondiscrimination clauses, and the Contractor may be declared ineligible for future contracts made by or on behalf of the Owner or agency of the Owner, until he or it satisfies the State Commission for Human Rights that he or it has established and is carrying out a program in conformity with the provisions of these non-discrimination clauses. Such findings shall be made by the State Commission for Human Rights after conciliation efforts by the

Commission have failed to achieve compliance with these nondiscrimination clauses and after a verified complaint has been filed with the Commission, notice thereof has been given to the Contractor and an opportunity has been afforded him to be heard publicly before three members of the Commission. Such sanctions may be imposed and remedies invoked independently of or in addition to sanctions or remedies otherwise provided by law.

7. If this Contract is canceled or terminated under the above clause, in addition to other rights of the Owner, provided in this contract upon its breach by the Contractor, the Contractor will hold the Owner harmless against any additional expenses or costs incurred by the Owner in completing the work or in purchasing the services, materials, equipment or supplies contemplated by this contract, and the Owner may withhold payments from the contractors in an amount sufficient for this purpose and recourse may be had against the surety on the performance bond if necessary.
8. The Contractor will include the provisions of these clauses in every sub-contract or purchase order in such a manner that such provisions will be binding upon each sub-contractor or vendor as to operations to be performed within the State of New York. The Contractor will take such action in enforcing such provisions of such Sub-Contract or purchase order as the contracting agency may direct, including sanctions or remedies for non-compliance. If the contractor becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor shall promptly so notify the Attorney General, requesting him to intervene and protect the interests of the Owner.

END OF SECTION

SECTION 01 3307
SED SPECIAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies special requirements of State Education Department, including Commissioner's Regulation Part 155.5, 155.7
   1. Copies of Commissioner's Regulation Part 155.5, 155.7 are available on the State Education Department's web site.www.p12nysed.gov

1.3 CERTIFICATE OF OCCUPANCY

A. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a Certificate of Occupancy.

1.4 GENERAL SAFETY AND SECURITY DURING CONSTRUCTION

A. All construction materials shall be stored in a safe and secure manner.
   1. Fences around construction supplies or debris shall be maintained.
   2. Gates shall always be locked unless a worker is in attendance, to prevent unauthorized entry.
   3. 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.
   4. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites.

1.5 SEPARATION OF CONSTRUCTION

A. Separation of construction areas from occupied spaces. Construction areas that are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Metal stud and gypsum board (Type X) must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.
   1. A specific stairwell and/or elevator may be assigned for construction worker use during work hours, when approved by the Owner. Workers may not use corridors, stairs or elevators designated for students or school staff.
      a. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
      b. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each work day. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

1.6 FIRE PREVENTION

A. There is no smoking on school property for fire prevention and New York State Law.

B. Any holes in floors or walls shall be sealed with a fire resistant material.

C. Owner shall maintain existing fire extinguishers.

D. Fire alarm and smoke detection systems shall remain in operation at all times.

1.7 CONSTRUCTION DIRECTIVES

A. Construction Noise. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken.

1. Construction Fume Control: The Contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes.
2. Off-Gassing Control. The Contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc., are scheduled, cured or ventilated in accordance with manufacturer's recommendations before a space can be occupied.
3. See General Conditions, Article 7, for additional Construction Change Directives information and requirements.

1.8 ASBESTOS/LEAD PAINT/HAZARDOUS MATERIAL

A. Asbestos/Lead Test Asbestos Letter. Indication that all school areas to be disturbed during renovation or demolition have been or will be tested for lead and asbestos.

B. Asbestos Code Rule 56. Large and small asbestos abatement projects as defined by 8 NYCRR 155.5(k) shall not be performed while the building is occupied. Note: It is SED's interpretation that the term "building" as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non combustible construction. The isolated portions (the occupied portion and the portion under construction) of the building must contain separate code compliant exits. The ventilation systems must be physically separated and sealed at the isolation barrier(s).

1. Asbestos TEM. The asbestos abatement area shall be completely sealed off from the rest of the building and completely cleaned and tested by TEM prior to re-entry by the public.

C. Lead Abatement Projects. A project that contains materials identified to be disturbed which tests positive for lead shall include that information in the Construction Documents. The Construction Documents must address the availability of lead testing data for the building and include a statement that the OSHA regulations be followed and that cleanup and testing be done by HUD protocol.

D. Hazardous Material: A project that disturbs or may disturb PCB containing material will have all work done in accordance with all applicable regulations.

1.9 VENTILATION

A. The work, as scheduled in the existing building, is to be performed when the facility is unoccupied. In the event that work is required to be performed during times when the building is occupied, all existing ventilation system between areas of work and areas of occupancy shall be disconnected, separated and code complying ventilation requirements be provided the occupied area. Prior to such work commencing the contractor shall submit a plan, for review indicating procedure to be taken. Also see paragraph 1.5 above for additional requirements."

1.10 ELECTRICAL CERTIFICATION:

A. The Electrical subcontractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation.

1.11 EXITING

A. Exiting: For work to be performed when school is in session all exiting will be clear and usable at all times. For work to be performed when school is not in session or after hours maintain legal exiting.

B. Exits required shall be clear and usable at all times.

C. All modifications or changes to the exiting plan shall be approved by Fuller and D'Angelo, Architects and Planners, .

1.12 CONSTRUCTION WORKER IN OCCUPIED AREAS

A. No worker shall be permitted in areas occupied by students. If access is required by the contractor's personnel they will be supervised by District personnel. Contractor shall provide 24 hour notice to the Owner when such access will be required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 3553
SITE SAFETY AND SECURITY PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. The safety requirements, which must be followed by the Contractor during the execution of this contract.

B. The Contractor agrees that the work will be completed with the greatest degree of safety and:

1. To conform to the requirements of the Occupational Safety and Health Act (OSHA) and the Construction Safety Act including all standards and regulations that have been or shall be promulgated by the governmental authorities which administer such acts, and shall hold the Owner, Owner's Representative, and Architect and all their employees, consultants and representatives harmless from and against and shall indemnify each and everyone of them for any and all claims, actions, liabilities, costs and expenses, including attorneys fees, which any of them may incur as a result of non-compliance.

C. Security measures including entry control, personnel identification, and miscellaneous restrictions.

1.3 REFERENCES:

A. Code of Federal Regulations OSHA Safety and Health.

B. Reference Drawing "Site Safety and Logistics Plan"**.**

1.4 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Use of premises and occupancy .

B. Section 01 5000 - Temporary Facilities and Controls01 5000: Temporary lighting and barriers and enclosures.

C. Section 01 5500 - Vehicular Access and Parking.

1.5 DEFINITIONS

A. Public shall mean anyone not involved with or employed by the contractor to perform the duties of this contract.

B. Site shall mean the limits of the work area.

C. Contractor shall mean the contractor, his/her subcontractors and any other person related to the contract execution.

1.6 SECURITY PROGRAM

A. Security and Protection Facilities and Services shall be the responsibility of the each Contractor and all costs shall be included in their bid.

B. Protect Work, existing premises and Brewster Central School District's operations from theft, vandalism, and unauthorized entry.

C. Initiate program in coordination with Brewster Central School District's existing security system thru the Owner's Representative at project mobilization.

D. Maintain program throughout construction period until directed by Owner's Representative.

1.7 ENTRY CONTROL

A. The existing building contains a security alarm system maintained and operated by the Owner. Access into the existing building shall not be permitted unless the Construction Manager is notified and arrangements made to deactivate the system

B. Restrict entrance of persons and vehicles into Project site and existing facilities.Owner

C. Allow entrance only to authorized persons with proper identification.

D. Maintain log of workers and visitors, make available to Owner's Representative on request.

E. Brewster Central School District will control entrance of persons and vehicles related to Brewster Central School District's operations.

F. Coordinate access of Brewster Central School District's personnel to site in coordination with Owner's Representative and Brewster Central School District and security forces thru the Owner's Representative.

G. Install substantial and durable general temporary enclosure of partially completed areas of construction. Provide locking entrances adequate to prevent unauthorized entrance, vandalism, theft and similar violations of project security.

H. Traffic Control

1. The Contractor shall maintain access for emergency vehicles and pedestrians and protect from damage all persons and property within the limits of and for the duration of the contract; as required by the contract documents.
2. Conduct construction operations so that the traveling public and pedestrian safety is subjected to a minimum of hazard and delay.
3. The Contractor shall perform the following minimum requirements and as directed by Owner's Representative.
    a. Keep the surface of the traveled way free from mounds, depressions, and obstructions of any type which could present hazards or annoyance to traffic.
    b. Keep the surface of all pavements used by the public free and clean of all dirt, debris, stone, timber, roofing, and masonry or other obstructions to provide safe traveled ways.
    c. Control dust and keep the traveled way free from materials spilled from hauling and construction equipment.
    d. Provide all cones, barricades, signs and warning devices as may be required and/or as ordered by Owner's Representative to safely carry out the foregoing. All such signs and devices shall be fabricated and placed in accordance with the latest "Federal Manual on Uniform Control Devices". Use of Open Flares Is Prohibited.
    e. Prepare and submit for approval sketch/drawing showing proposed location and type of signs, barricades and devices as required in Par. 6 above.
    f. The Contractor shall cover with steel plates all open trenches at the close of each work day. Such plates to abut each other and be wedged at each end of trench to prevent plates from sliding open. Coordinate as required with other sub contractors and Owner's Representative.
4. Ingress and Egress
    a. The Contractor shall provide and maintain at all times safe and adequate ingress and egress to and from site at existing or at new access points consistent with work, unless otherwise authorized by the Owner's Representative.
5. If, upon notification by Owner's Representative, and the Contractor fails to correct any unsatisfactory condition within 24 hours of being so directed, Owner's Representative will immediately proceed with adequate forces to properly maintain the project and the entire cost of such maintenance shall be deducted (back charged) from any moneys due the contractor.
6. All traffic control costs shall be included in the base bid for furnishing all labor, material and equipment including the cost of any and all incidental required by job conditions as ordered by Owner's Representative.

1.8 FIRE PREVENTION AND CONTROL

A. The Contractor shall provide Fire Extinguishers as follows: Provide type "A" fire extinguishers for temporary offices and similar spaces where there is minimal danger of electrical fires or grease-oil-flammable liquid fires. In other locations provide either type "ABC" dry chemical

extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.

B. All required exits, fire alarm, and security and similar systems shall be maintained and operable throughout the entire construction contract.
   1. Contractor will be back-charged for all fines imposed for false alarms or service calls.

C. Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations. Portable fire extinguishers shall be provided by each Contractor and made conveniently available throughout the construction site. Contractor(s) shall notify their employees of the location of the nearest fire alarm pull stations at all locations where work is in progress.

D. The Contractor shall take all possible precautions for the prevention of fires. Where flame cutting torches, blow torches, or welding tools are required to be used within the building, their use shall be as approved by the Owner's Representative at the site. When welding tools or torches of any type are in use, have available in the immediate vicinity of the work a fire extinguisher of the dry chemical 20 lbs. Type. The fire extinguisher(s) shall be provided and maintained by the Contractor doing such work.

E. Fuel for cutting and heating torches shall be gas only and shall be contained in Underwriters laboratory approved containers.

F. Storage of gas shall be in locations as approved by the Owner's Representative and subject to Fire Department regulations and requirements.

G. No volatile liquids shall be used for cleaning agents or as fuels for motorized equipment or tools within a building except with the express approval of the Owner and/or Architect and in accordance with local codes. On-site bulk storage of volatile liquids shall be outside the buildings at locations directed by the Owner, who shall determine the extent of volatile liquid allowed within the building at any given time.

H. The Contractor shall comply with the following requirements relating to compressed gas:
   1. Where compressed gas of any type is used for any purpose at the site, it shall be contained in cylinders complying with ICC regulations. Gases of different types shall not be stored together except when in use and when such proximity is required.
   2. All gas cylinders shall be stored in sheds constructed of noncombustible materials. Sheds shall be well ventilated and without electric lights or fixtures and shall be located as far from other buildings as is practicable. All gas cylinders not in actual use, or in proposed immediate use, shall be removed from the building under construction or reconstruction. Empty gas cylinders shall be removed prior to bringing in a replacement cylinder. Cylinders shall at all times be supported and braced in an upright position. When not in use, the protective cap shall be screwed over the valve.
   3. All persons required to handle gas cylinders or to act as temporary firemen (Fire Watchers) shall be able to read, write and understand the English language; they shall also be required by the Contractor to read Part 3 of Pamphlet P-1 “Safe Handling of Compressed Gases” published by the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
   4. Where local ordinances are in effect regarding gas cylinders, (their use, appurtenances and handling), such ordinances shall supplement the requirements of this paragraph. All personnel engaged in fire watch shall be certified by the Local Fire Department having jurisdiction.
   5. LP-Gas Heating will not be permitted in enclosed areas below grade.
   6. Any cylinder not having the proper ICC markings or reinspection marking, or any cylinder with a leak shall be isolated immediately away from any building and the supplier shall be immediately notified; such other precautions as may be required to prevent damage or injury shall also be taken by the Contractor.

1.9 PERSONNEL IDENTIFICATION

A. Provide identification badge or other approved identification to each person authorized to enter premises.
   1. Identification To Include: Personal photograph, name and employer.

B. Maintain a list of accredited persons, submit copy to Owner's Representative on request.

C. Require return of badges at expiration of their employment on the Work.

D. Fingerprinting: The Contractor acknowledges and agrees that he/she or its employees may be subject to fingerprinting and a criminal history record check as may be required by the Educational Law of the State of State of New York. In such an event, Contractor agrees to cooperate with Brewster Central School District and to complete any and all forms or procedures, all at no cost or expense to the Brewster Central School District.

1.10 RESTRICTIONS

A. Do not allow cameras on site or photographs taken except by written approval of Construction Manager.

PART 2 PRODUCTS -

2.1 MATERIALS

A. Refer to Section 01 5000 - Temporary Facilities and Controls for additional barrier requirements.

B. Barriers shall be constructed of sturdy lumber having a minimum size of 2 x 4.

C. Signs shall be made of sturdy plywood of 1/2" minimum thickness and shall be made to legible at a distance of 50 feet.

PART 3 EXECUTION

3.1 GENERAL

A. Each Prime Contractor is to submit their corporate safety policy within 2 weeks after notice to proceed. Plan to meet OSHA standards. Each prime contractor shall make participation of their sub-contractors in this program mandatory. These safety policies shall be detailed company policy defining specifics as to how a safe work environment shall be maintained.

B. Each Prime Contractor and sub-contractors shall schedule weekly safety meetings (Job Site Safety Talks) and submit minutes indicating attendees and topics, to the Construction Manager.

C. Each Prime Contractor shall identify in writing to the Construction Manager their "OSHA competent Person Regarding Safety". Definition: "Competent Person" meaning one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them.

D. In the performance of its contract, each Contractor shall exercise every precaution to prevent injury to workers and the public or damage to property.

1. The GeneralContractor shall, at their own expense, provide temporary structures, place watchmen, design and erect barricades, fences and railings, give warnings, display such lights, signals and signs, exercise such precautions against fire, adopt and enforce such rules and regulations, and take such other precautions as may be necessary, desirable or proper or as may be directed.
2. The General Contractor shall provide all flagmen required for deliveries to the site.All deliveries crossing the site or student traffic areas shall be escorted by flagmen. All flagmen shall wear orange vests. All deliveries shall be scheduled and coordinated with the Construction Manager and the Owner. Delivery blackout periods for bus traffic interference shall be established with the Construction Manager.
3. Each Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work to be done under this contract. Each Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss including but not limited to:
    a. All employees working in connection with this contract, and other persons who may be affected thereby.
    b. All the work materials and equipment to be incorporated therein whether in storage on or off site; and including trees, shrubs, lawns, walks, pavements, facilities not designated for removal, relocation or replacement in the course of construction.

E. Each Contractor's duties and responsibilities for the safety and protection of the work: shall continue until such time as all the work is completed and contractor has removed all workers, material and equipment from the site, or the issuance of the certificate of final completion, whichever shall occur last.

F. Each Contractor shall use only machinery and equipment adapted to operate with the least possible noise, and shall so conduct his operations that annoyance to occupants of the site and nearby homes and facilities shall be reduced to a minimum

G. It shall be the responsibility of each Contractor to insure that all employees of the contractor and all subcontractors, and any other persons associated with the performance of their contract shall comply with the provisions of this specification.

H. The Contractor shall clean up the site daily and keep the site free of debris, refuse, rubbish, and scrap materials. The site shall be kept in a neat and orderly fashion. Before the termination of the contract. The Contractor shall remove all surplus materials, falsework, temporary fences, temporary structures, including foundations thereof.

I. Each Contractor shall follow all rules and regulations put forth in the Code of Federal Regulations (OSHA Safety and Health Standards).

J. Each Prime COntractor will ensure that all their employees and sub-contracors employees, while on school properety will wear hard hats, high visibility vests and ID badges at all times.Anyone on site without this safety gear will be escorted off of school property.

END OF SECTION

SECTION 01 3554
PREVAILING WAGE RATES

1.1 RELATED DOCUMENTS

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

1.2 PROVISIONS OF LAW DEEMED INSERTED

A. Each and every provision of law and clauses required by law to be inserted in the Contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the Contract shall forthwith be physically amended to make such insertion.

B. The Contractor and subcontractors shall comply with applicable provisions of the Labor Law and all other state laws and Federal and Local statues ordinances, codes, rules and regulations and orders which are applicable to the performance of this contract. The Contractor shall likewise require all sub-contractors to comply therewith. The attention of the Contractor is particularly, but not exclusively, directed to Sections 220 through 223 of the New York State Labor Law and Sections 109 of the New York State Municipal Corporations Law and the following:

1. The Contractor shall post the prevailing wages in a conspicuous place on the job site.
2. Posters shall list the Department of Labor's Public work field offices with telephone numbers.

C. All contractors and subcontractors shall furnish each of its workers with written notification of the applicable prevailing wage rates and supplements at the commencement of and at periodic intervals during the performance of the Work as required by the New York Labor Law

D. The Contractor shall provide and keep certified payroll records at the job site.

E. Prevailing Wages Schedule for this project can be obtained by the bidders on the DOL web site as follows:

1. http://www.labor.ny.gov/workerprotection/publicwork/PWContents.shtm.
2. Click on: "Request for Wage and Supplement Information" (PW39).
3. View "Previously Requested Prevailing Wage Schedule" using PRC# 2024002534

F. NOTE THESE WAGE RATES ARE EFFECTIVE UNTIL JUNE 30, of each year. Updated schedules will be available on the Department of Labor web site: www.labor.state.ny.us

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. Testing and inspection agencies and services.

D. Contractor's construction-related professional design services.

E. Contractor's design-related professional design services.

F. Control of installation.

G. Mock-ups.

H. Tolerances.

I. Manufacturers' field services.

J. Defect Assessment.

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 4216 - Definitions.

D. Section 01 4219 - Reference Standards.

E. Section 01 4534 - Code Required Special Inspections.

F. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.4 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a, with Editorial Revision (2016).

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.

G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

1.5 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:

1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary bracing.
4. Investigation of soil conditions to support construction equipment.

1.6 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections and drawings.

C. Scope of Contractor's Professional Design Services: Provide for the following but not limited to the following items of work:
1. Concrete Mix Design: As described in Section 03 3000 - Cast-in-Place Concrete. No specific designer qualifications are required.
2. Structural Design of Steel Connections: As described in Section 05 1200 - Structural Steel Framing.
3. Structural Design of Steel Connections: As described in Section 05 2100 - Steel Joist Framing.
4. Structural Design of Metal Framing: As described in Section 05 4000 - Cold-Formed Metal Framing.
5. Structural Design of Metal Fabrications: As described in Section 05 5000 - Metal Fabrications.
6. Structural Design of Stairs: As described in Section 05 5100 - Metal Stairs.
7. Structural Design of Railings: As described in Section 05 5213 - Pipe and Tube Railings.
8. Structural Design of Canopy: As described in Section 10 7316.13 - Metal Canopy.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Testing Agency Qualifications:
1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

C. Design Data: Submit for Construction Manager's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Brewster Central School District's information.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and Construction Manager:
1. Include:
a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Compliance with Contract Documents.
k. When requested by Architect and Construction Manager, provide interpretation of results.

2. Test report submittals are for Architect and Construction Manager's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect and Construction Manager, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and Construction Manager.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Architect and Construction Manager's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Architect and Construction Manager's benefit as contract administrator.
1. Submit report in PDF format within 30 days of observation to Architect, Construction Manager, and Contractor for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

H. Erection Drawings: Submit drawings for Architect and Construction Manager's benefit as contract administrator..
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect and Construction Manager.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in New York.

1.9 REFERENCES AND STANDARDS - See Section 01 4219

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Brewster Central School District will employ and pay for services of an independent testing agency to perform specified testing which is the responsibility of the Owner.

B. As indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform specified testing which is the responsibility of the Contractor.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:

1. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
2. Laboratory: Authorized to operate in New York.
3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Construction Manager before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality for Architect and Construction Manager will use to judge the Work.

C. Notify Architect and Construction Manager fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

G. Obtain Architect and Construction Manager's approval of mock-ups before starting work, fabrication, or construction.
   1. Construction Manager will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
   2. Make corrections as necessary until Architect's approval is issued.

H. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

I. Where mock-up has been accepted by Architect and Construction Manager and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Construction Manager.

3.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Construction Manager and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect , Construction Manager, and Contractor of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Architect and Construction Manager.
   7. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of the Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and Construction Manager and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Brewster Central School District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Owner's Representative, Architect, and Construction Manager.

F. Re-testing required because of non-conformance to specified requirements shall be shall be performed by the same agency on instructions by Construction Manager paid for by Contractor.

3.5 OWNER'S TESTING AND INSPECTIONS

A. Coordinate with Construction Manager.

B. Owner will engage a qualified testing agency or special inspector to conduct tests and inspections are the responsibility of Owner and paid for by Owner as follows:
   1. Reefer to Section 01 4534 - Code Required Special Inspections.
   2. Asbestos inspection and air monitoring
   3. Soil bearing capacity and bottom of footings.
   4. Compaction and backfilling.
   5. Compaction of structural fill.
   6. Wall footings and pier footing reinforcing, size and placement.
   7. Foundation wall reinforcing and placement.
   8. Slab on grade thickness and reinforcing placement.
   9. Floor slabs above grade thickness and reinforcing placement.
   10. Concrete samples and compression tests.
   11. Mortar sampling and testing.
   12. Placement of joint reinforcement.
   13. Placement of anchors.
   14. Placement of concealed flashing.
   15. Cast stone anchors.
   16. Placement of cavity insulation.
   17. Placement of cavity drainage material.
   18. Placement of weep holes.
   19. Structural steel column, beam and miscellaneous framing members..
   20. Field bolts & welded connections.
   21. Shop fabrication and welding.
   22. Welder's certificates.
   23. Steel studs.
   24. Placement and type of metal deck.
   25. Attachment of deck to steel.
   26. Pour stops and framed openings.
   27. Testing of shear studs.
   28. Size, placement and fasteners of light gauge metal framing.
   29. Exterior wall system including metal framing fasteners, gypsum sheathing, vapor barrier, masonry, insulation
   30. Aluminum windows connections and fasteners.
   31. Firestopping.
   32. Radon testing.

C. Contractor shall perform the work in an efficient manner consistent with industry standards. Excessive testing resulting from the contractor's inability to perform efficiently will result in back charges to the contractor.

D. All re-inspections required for work not properly installed shall be paid for by the contractor.

E. The Owner will not be liable for any costs or delay claims due to the testing agency or special inspector failure to provide inspection without proper and sufficient notification.

F. All requests by the contractor for inspection that are cancelled and result in charges to the Owner will be back charged to the contractor.

3.6 CONTRACTOR'S TESTING AND INSPECTION

A. Testing and Inspections shall be conducted by a qualified testing agency or special inspector, approved by the Construction Manager as required by authorities having jurisdiction and as indicated in individual Specification Sections as the contractor's responsibility including but not limited to:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Construction Manager promptly of irregularities and deficiencies observed in the work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Construction Manager with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.
7. All design mixes.
8. Testing and balancing of all mechanical and plumbing.
9. Testing Fire Alarm, smoke detection systems, and emergency light
10. Testing technology data and communications systems.
11. Testing fire protection system.
12. Testing public address system.
13. Electrical systems.
14. Electrical Certification: The Electrical Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation.
15. Testing as required by individual specification sections.

3.7 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start up of equipment, testing, and adjusting testing as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Construction Manager 30 days in advance of required observations.

1. Observer subject to approval of Architect and Construction Manager.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.8 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect and Construction Manager, it is not practical to remove and replace the Work, Architect and Construction Manager will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY of REFERENCE STANDARDS

A. The Owner shall file and obtain the Building Permit.

B. Regulatory requirements applicable to this project are the following:

C. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

D. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

E. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.

F. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

G. NFPA 1 - Fire Code; 2021, with Errata (2022).

H. NFPA 101 - Life Safety Code; 2017.

I. NFPA 72 - National Fire Alarm Code

J. New York State Uniform Fire and Building Codes known as the “Building Codes of the State of New York” and consist of the following:

1. State Education Department Planning Standards, including Commissioner's Regulation Part 155.5, 155.7
2. Energy Conservation Construction Code of New York State
3. Fire Code of New York State
4. Fuel Gas Code of New York State
5. Mechanical Code of New York State
6. Plumbing Code of New York State
7. Utility Company Regulations and Requirements.
8. Classification of Construction: Type IIB.
9. Occupancy Classification:Education E
10. State Education Department: Planning Standards is applicable to the work. Any conflicts between the Building Codes of New York and the State Education Department Planning Standards, the most restrictive shall apply. Copies of the Planning standards are available at the SED web site.

K. Electrical Certification: The Electrical Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for certification of electrical installations.

L. Each Contractor shall furnish and pay for all other permits, fees and other installation costs required for the various installations by governing authorities and utility companies; prepare and file drawings and diagrams required; arrange for inspections of any and all parts of the work required by the authorities and furnish all certificates necessary to the Owner's Representative, Architect, and Construction Manager as evidence that the work installed under this Project conforms with all applicable requirements of the State Codes, National Board of Fire Underwriters, and National Electric Code.

M. Any items of work specified herein and shown on the drawings which conflict with aforementioned rules, regulations and requirements, shall be referred to the Architect, Owner, and Construction Manager for decision, which decision shall be final and binding.

N. The work shall not be deemed to have reached a state of completion until the certificates have been delivered

O. EPA - Environmental Protection Agency

P. IEEE - Institute of Electrical And Electronic Engineers

Q. NEMA - National Electrical Manufacturers Association

R. UL - Underwriters Laboratories

S. OSHA Part 1926 Safety and Health Regulations for Construction.

T. Federal Regulation for Asbestos Abatement
1. Title 30 CFR Part 61, Subpart G; The Transport and Disposal of Asbestos Waste
2. The Transport and Disposal of Asbestos Waste]
3. Title 40 CFR, Part 763 Asbestos Containing Materials in Schools; Final Rule and Notice
4. Title 49 CFR Parts 106, 107, and 171-179.The Transportation Safety Act of 1974 and the Hazardous Material Transportation Act..
5. Public Law 101-637 ASHARA

U. New York State Official Compilation of Codes, Rules and Regulations
1. Title 12 Part 56
2. Title 10 Part 73
3. Title 6 Parts 360-364
4. Labor Law - Article 30 and Sections 900-912
5. All applicable Additions, Addenda, Variances and Regulatory Interpretation Memoranda

1.3 MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

A. Pursuant to NYS Labor Law §220-h - All laborers, workers and mechanics working on the site are required to be certified as having successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project.

B. All contractors and their subcontractor's project superintendent, employees, directly or indirectly employed by the contractor to work on the project must at all times, whenever on the school property, wear an ID badge, safety vest, hard hat, etc. and all other required personal protective equipment as required by OSHA

1.4 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

B. Section 01 4219 - Reference Standards

C. Division 22 - Plumbing.

Division 23 - Heating, Ventilation and Air Conditioning.

Division 26 - Electrical.

D. Division 31 - Earthwork.

E. Division 32 - Exterior Improvements

F. Division 33 - Utilities.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in New York .

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4216
DEFINITIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.3 DEFINITIONS

A. Owner: The term “Owner shall mean Brewster Central School District and their duly authorized representative.

1. The word “Owner” and the words “School Board”, “City School District”, “Board of Education”, “Union Free School District”, “Central School District”, etc., shall have the same meaning.

B. Architect: The term "Architect" or “Engineer” or the words “Architect/Engineer” shall mean the Professional Architect responsible for the contract documents, Fuller and D'angelo P.C..

C. Owner's Representative: The term Owner's Representative shall mean Triton Construction Co.

D. Construction Manager: The term Construction Manager shall mean School Construction Consultants

E. The term Consultant shall mean those firms listed on the cover of Project Manual

F. Contractor for Construction: The term “Contractor for Construction”, “General Contractor” “Contractor for General Work” “Construction Contractor” shall have the same meaning.

G. Contractor for Plumbing: The term “Plumbing Contract”, “Plumbing Contractor” “Contractor for Plumbing” shall have the same meaning.

H. Contractor for Mechanical: The term "Mechanical Contractor" “HVAC Contract”, “HVAC Contractor” “Contractor for HVAC”, "Heating, Ventilation and Air Conditioning Contractor" shall have the same meaning.

I. Contractor for Electrical: The term “Electrical Contract”, Electrical Contractor” “Contractor for Electric” shall have the same meaning.

J. Contractor(s): Shall include all separate contractor(s) have contracts with the Owner for the same project and may include but not limited to: General Construction, Plumbing, HV, HVAC, Electrical, Site and others.

K. Prime Contractors: Shall include all separate contractors have contractors with the Owner for the same project and may include but not limited to: General Construction, Plumbing, Mechanical Contractor, Electrical, and Site and others

L. "Approved": The term "approved," when used in conjunction with Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract and Section 01 3000 - Administrative Requirements.

M. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.

N. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

O. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

P. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.

Q. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

R. 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 trades people of the corresponding generic name.

S. "Project site" is the space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.

T. The term “Building Code” shall mean the Building Code of the State of New York including all amendments and reference standards to date.

U. "Work" - Labor, materials, equipment, apparatus, controls, accessories, and all other items customarily furnished and/or required for proper and complete disconnection and reconnection, installation of new work.

V. "Wiring" - Conduit, fittings, wire, junction and outlet boxes, switches, cutouts, and receptacles and all items necessary or required in connection with or relating to such wiring.

W. "Concealed" - Embedded in masonry or other construction, installed behind wall furring, within double partitions, or hung ceilings, in trenches, or in crawl spaces.

X. "Exposed" - Not installed underground or "Concealed" as defined above.

Y. Furnish: The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations..

Z. Install: The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

AA. 'Noted' - as indicated on the drawings and/or specifications.

AB. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

AC. Provide: To furnish and install complete and ready for the intended use.

AD. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4219
REFERENCE STANDARDS

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 SECTION INCLUDES

A. Requirements relating to referenced standards.

1.3 RELATED REQUIREMENTS

A. Document 00 7200 - General Conditions: Reference standards.

1.4 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with the reference standard of date of issue specified in this section, except where a specific date is established by applicable code.

C. Obtain copies of standards when required by Contract Documents.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Date of Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

1.5 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract and Section 01422 Definitions

1.6 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents, including reference standards in codes having jurisdiction, 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. 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 the requirements. Refer uncertainties to Architect for a decision before proceeding.

C. 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.

D. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.1 Abbreviations and Names:

A. Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries or the internet.

LIST OF REFERENCES

3.1 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.

B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

D. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

E. AAMA SFM-1 - Aluminum Storefront and Entrance Manual; 2014.

3.2 AASHTO -- AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 2017.

3.3 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS

3.4 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 303R - Guide to Cast-in-Place Architectural Concrete Practice; 2012.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI 305R - Guide to Hot Weather Concreting; 2010.

F. ACI 306R - Guide to Cold Weather Concreting; 2016.

G. ACI 308R - Guide to External Curing of Concrete; 2016.

H. ACI 347R - Guide to Formwork for Concrete; 2014.

I. ACI 440.1R - Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars; 2015, with Errata (2020).

J. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

K. ACI MNL-66 - ACI Detailing Manual; 2020.

3.5 AI -- THE ASPHALT INSTITUTE

A. AI SS-2 - Specifications for Paving and Industrial Asphalts; 1995.

3.6 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE

A. ANSI/AWI 0641 - Architectural Wood Casework; 2019.

B. ANSI/BHMA A156.29 - Standard for Exit Locks, Exit Alarms, Alarms for Exit Devices; 2017.

C. ANSI A208.1 - American National Standard for Particleboard; 2009.

D. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.

E. ANSI A224.1 - American National Standard Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1990.

F. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

G. ANSI A300 Part 5 - American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction); 2019.

H. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

3.7 ASHRAE -- AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.

A. ASHRAE (FUND)-2017 - ASHRAE Handbook - Fundamentals; 2017.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASHRAE Std 62.1-2019 - Ventilation for Acceptable Indoor Air Quality; 2019, with Errata and Amendments (2021).

3.8 ASME -- THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

A. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.

B. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts; 2020.

3.9 ASTM A Series -- ASTM INTERNATIONAL

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

D. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2017).

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

F. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.

G. ASTM A526/A526M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality; 1990.

H. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

J. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

K. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015 (Reapproved 2021).

L. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

M. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

N. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

3.10 ASTM F Series -- ASTM INTERNATIONAL

A. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

B. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

3.11 AWI -- ARCHITECTURAL WOODWORK INSTITUTE

A. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.

B. AWI P-201 - Architectural Casework; 1989.

C. AWI P-206 - Guide to Wood Species; 1977.

D. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

3.12 AWS -- AMERICAN WELDING SOCIETY

A. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

C. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.

D. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

3.13 CAL -- STATE OF CALIFORNIA

A. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.

3.14 IAAF -- INTERNATIONAL AMATEUR ATHLETIC FEDERATION

3.15 NAAMM -- THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

A. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

B. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

3.16 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

A. NFPA 1 - Fire Code; 2021, with Errata (2022).

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

E. NFPA 101 - Life Safety Code; 2017.

F. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

3.17 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION

A. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

B. NRCA (RM) - The NRCA Roofing Manual; 2023.

3.18 PCI -- PRECAST/PRESTRESSED CONCRETE INSTITUTE

A. PCI MNL-123 - Connections Manual: Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.

3.19 UL -- UNDERWRITERS LABORATORIES INC.

A. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

B. UL (DIR) - Online Certifications Directory; Current Edition.

C. UL (FRD) - Fire Resistance Directory; Current Edition.

D. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

E. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

END OF SECTION

SECTION 01 4533
CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL REQUIREMENTS

A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the New York State Uniform Code (NYSUC).

1.3 SECTION INCLUDES

A. Code-required special inspections.

B. Testing services incidental to special inspections.

C. Submittals.

D. Manufacturers' field services.

E. Fabricators' field services.

1.4 OWNER RESPONSIBILITY

A. All Code required testing will be performed and paid for by the Owner.

B. Owner's Representative will provide Special Inspector with complete set of executed Contract Bid Documents.

1.5 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Allowance for payment of testing and inspection services.

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 4000 - Quality Requirements.

D. Section 01 4219 - Reference Standards.

E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.6 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authority having jurisdiction.

B. IAS: International Accreditation Service, Inc.

C. NIST: National Institute of Standards and Technology.

1.7 GENERAL REQUIREMENTS

A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the Building Code of New York State (BCNYS).

B. Owner’s Representative will schedule a Special Inspections preconstruction meeting at least 7 days prior to initial planned date for start of construction.

1. Discussions shall include the following:
    a. Review of specifications and Schedule of Special Inspections for work requiring Special Inspections.
    b. Responsibilities of the Prime Contractors, Owner, Testing Agency, Special Inspector, and Registered Design Professional.
    c. Notification and reporting procedures.
2. Attendees shall include Owner’s Representative, Contractor, Testing Agency, Special Inspector(s), and Geo-Tech Engineer.

1.8 DEFINITIONS

A. Code or Building Code: ICC (IBC)-2018, Edition of the International Building Code and specifically, Chapter 17 - Special Inspections and Tests.

B. Registered Design Professional(RDP): Licensed Professional Engineer or Registered Architect whose seal appears in the Construction Drawings. Unless noted otherwise, references to the Registered Design Professional (RDP) in this section refers to Fuller and D'Angelo, P.C. or their Consultants for building design.

C. Owner's Representative: The term Owner's Representative shall mean Triton Construction Co..

D. Special Inspection:

1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the State Building Code that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
2. Special inspections are separate from and independent of tests and inspections conducted by Contractor for the purposes of quality assurance and contract administration.

E. Special Inspector: A Professional Engineer registered in the State of New York that has a minimum of four years of design experience with buildings and qualified to perform inspections assigned including structural, geotechnical, and electrical.

F. Testing/Inspecting Agency: Agent retained by Owner and coordinated by Owner’s Representative to perform some inspection services on behalf of Owner.

G. Testing/Inspecting Agency (Agent 1): Professional Engineer licensed in the State of New York that is qualified to perform structural inspections. The Special Inspector shall have a minimum of three years of experience performing inspections for similar projects.

H. Testing/Inspecting Agency (Agent 2): Professional Geotechnical Engineer licensed in the state of New York that is qualified to perform inspections for preparation of building subgrades and foundations.

I. Testing/Inspecting Agency (Agents 3 or 4): Agency or firm qualified to inspect certain structural elements and perform field and laboratory tests to determine the characteristics and quality of building materials and workmanship.

J. Statement of Special Inspections: Documents prepared by the Registered Design Professional and filed with and approved by the Owner’s Representative, listing materials and work requiring Special Inspections. These documents include this specification and the Schedule of Special Inspections.

K. Schedule of Special Inspections: An itemized list of inspections, verifications, and tests (including frequency) required for the project and individuals, agencies, or firms who will be retained to perform these services. .

L. Seismic/Wind-Force-Resisting System: Components of the structural system that provide resistance to seismic/wind forces. These components are identified in the Schedule of Special Inspections.

M. Continuous Special Inspection: Testing Agency to perform full-time observation of work while the work is being performed.

N. Periodic Special Inspections: Part-time or intermittent observation of work by the Special Inspector or Testing Agency for work that has been or is being performed and at completion of work.

1.9 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

C. TMS 402/ACI 530/ASCE 5) Building Code Requirements and Specification for Masonry Structure

D. AISC 360 - Specification for Structural Steel Buildings; 2016.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.

F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

G. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.

H. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2017.

I. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2014a.

J. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

K. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.

L. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.

M. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2014b.

N. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a (Reapproved 2015).

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

P. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.

Q. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

R. IAS AC291 - Accreditation Criteria for Special Inspection Agencies; 2017.

S. ICC (IBC) - International Building Code; 2018.

T. ICC (IBC)-2018 - International Building Code; 2018.

U. SDI (QA/QC) - Standard for Quality Control and Quality Assurance for Installation of Steel Deck; 2017.

V. SJI 100 - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2011.

1.10 QUALIFICATIONS

A. Testing Agency shall be accepted by the Owner’s Representative, Architect, and Special Inspector.

B. Special Inspections shall be performed by agents who have relevant experience for each category of inspections indicated in the drawings.

1.11 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Special Inspection Agency Qualifications: Prior to the start of work, the Testing Agency and Special Inspector shall:

1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Submit documentation that Special Inspection Agency is accredited by IAS according to IAS AC291.

C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency is required to:

1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Submit certification that Testing Agency is acceptable to AHJ.
4. Submit documentation that Testing Agency is accredited by IAS according to IAS AC89.

D. Manufacturer's Qualification Statement: Manufacturer shall submit documentation of manufacturing capability and quality control procedures.

E. Fabricator's Qualification Statement: Fabricator shall submit documentation of fabrication facilities and methods as well as quality control procedures.

F. Special Inspection Reports: After each special inspection, Special Inspector shall promptly submit one electronic copy of report, in PDF format, to Owner’s Representative, Architect, and Contractor.
1. Include:
   a. Date issued.
   b. Project title and number.
   c. Name of Special Inspector.
   d. Date and time of special inspection.
   e. Identification of product and specifications section.
   f. Location in the Project.
   g. Type of special inspection.
   h. Date of special inspection.
   i. Results of special inspection.
   j. Compliance with Contract Documents.
2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

G. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector shall promptly submit one electronic copy of report, in PDF format to Owner’s Representative, Architect, and Contractor.
1. Include:
   a. Date issued.
   b. Name of Special Inspector.
   c. Date and time of special inspection.
   d. Identification of fabricated item and specification section.
   e. Location in the Project.
   f. Results of special inspection.
   g. Verification of fabrication and quality control procedures.
   h. Compliance with Contract Documents.
   i. Compliance with referenced standard(s).

H. Test Reports: After each test or inspection, promptly submit one electronic copy, in PDF format, to .Owner’s Representative, Architect, and Contractor.
1. Include:
   a. Date issued.
   b. Project title and number.
   c. Name of inspector.
   d. Date and time of sampling or inspection.
   e. Identification of product and specifications section.
   f. Location in the Project.
   g. Type of test or inspection.

h. Date of test or inspection.
i. Results of test or inspection.
j. Compliance with Contract Documents.

2. Compliance with referenced standard(s).

I. Certificates: When specified in individual special inspection requirements, Special Inspector shall submit certification by the manufacturer, fabricator, and installation subcontractor to Owner's Representative, Contractor, and Special Inspector, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Owner's Representative .

J. Manufacturer's Field Reports: Submit reports to

1. Submit report in, electronic copy, in PDF format, within 30 days of observation to Owner's Representative, Architect, and Contractor for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.

K. Fabricator's Field Reports: Submit reports to Owner's Representative and Architect

1. Submit report, in PDF format, within 30 days of observation to Owner's Representative and Architect for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.

1.12 SPECIAL INSPECTION AGENCY

A. Owner will employ and pay for services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.

B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.

C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.13 TESTING AND INSPECTION AGENCIES

A. Owner's Representative will employ services of an independent testing agency to perform additional testing associated with special inspections but not required by the building code or specification.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.14 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:

1. Independent firm specializing in performing testing and inspections of the type specified in this section.
2. Accredited by IAS according to IAS AC291.

B. Testing Agency Qualifications:

1. Independent firm specializing in performing testing and inspections of the type specified in this section.
2. Accredited by IAS according to IAS AC89.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
   1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.2 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION (INCLUDING METAL DECK)

A. Structural Steel: Comply with quality assurance inspection requirements of ICC (IBC).

B. Cold-Formed Steel Deck: Comply with quality assurance inspection requirements of SDI (QA/QC).

C. Open-Web Joists and Joist Girders: Comply with requirements of ICC (IBC), Table 1705.2.3.
   1. End Connections - Welding or Bolted: Comply with requirements of SJI 100; periodic.
   2. Bridging - Horizontal or Diagonal:
      a. Standard Bridging: Comply with requirements of SJI 100; periodic.
      b. Bridging That Differs From the SJI Specifications: Periodic inspection.

D. Special Inspector shall perform the following:
   1. Verify Fabricator maintains detailed fabrication and Quality Control procedures:
      a. Review procedures for completeness and adequacy relative to code requirements.
      b. If Fabricator is designated as AISC-Certified Fabricator, Special Inspection for shop-fabricated members and assemblies is not required.
      c. If Fabricator is not designated as AISC-Certified Fabricator, Contractor shall reimburse Owner via execution of credit change order for cost of Special Inspections and testing in Fabricator’s shop.
   2. Review manufacturer’s Certificates of Compliance for high-strength bolts and weld filler material.
   3. Review certified mill test reports.
   4. Inspect steel frame joint details for compliance with approved Construction Documents.

E. High-Strength Bolt, Nut and Washer Material:
   1. Verify identification markings comply with ASTM standards specified in the approved contract and to AISC 360, Section A3.3; periodic.
   2. Submit manufacturer's certificates of compliance; periodic.

F. High-Strength Bolting Installation: Verify items listed below comply with AISC 360, Section M2.5.
   1. Snug tight joints; periodic.
   2. Pretensioned and slip-critical joints with matchmarking, twist-off bolt or direct tension indicator method of installation; periodic.
   3. Pretensioned and slip-critical joints without matchmarking or calibrated wrench method of installation; continuous.

G. Structural Steel and Cold Formed Steel Deck Material:
   1. Structural Steel: Verify identification markings comply with AISC 360, Section M3.5; periodic.
   2. Other Steel: Verify identification markings comply with ASTM standards specified in the approved Contract Documents; periodic.
   3. Submit manufacturer's certificates of compliance and test reports; periodic.

H. Welding:
   1. Structural Steel and Cold Formed Steel Deck:

a. Complete and Partial Joint Penetration Groove Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
b. Multipass Fillet Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
c. Single Pass Fillet Welds Less than 5/16 inch (7.94 mm) Wide: Verify compliance with AWS D1.1/D1.1M; periodic.
d. Plug and Slot Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
e. Single Pass Fillet Welds 5/16 inch (7.94 mm) or Greater: Verify compliance with AWS D1.1/D1.1M; continuous.
f. Floor and Roof Deck Welds: Verify compliance with AWS D1.3/D1.3M; continuous.

I. Steel Frame Joint Details: Verify compliance with approved Contract Documents.
1. Details, bracing and stiffening; periodic.
2. Member locations; periodic.
3. Application of joint details at each connection; periodic.

3.3 COLD FORMED STEEL LIGHT FRAME CONSTRUCTION:

A. Stud spacing, size, grade and thickness.

B. Framing layout, bearing length, bridging, blocking, web stiffeners and holes.

C. Field welding;

D. Screw attachment, bolting, anchoring and other fastening of components.

E. Screw attachment of sheathing,

3.4 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

A. Reinforcing Steel, Including Placement: Verify compliance with approved contract documents and ACI 318, Sections 3.5 and 7.1 through 7.7; periodic.
1. Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that the reinforcing bars are free from oil and other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters.

B. Anchors Cast in Concrete: Verify compliance with ACI 318; periodic.

C. Bolts Installed in Concrete: Where allowable loads have been increased or where strength design is used, verify compliance with approved Contract Documents and ACI 318, Sections 8.1.3 and 21.2.8 prior to and during placement of concrete; continuous.

D. Anchors Post-Installed in Hardened Concrete: Verify compliance with ACI 318.
1. Adhesive Anchors: Verify horizontally or upwardly-inclined orientation installations resisting sustained tension loads - Section 17.8.2.4; continuous.
2. Other Mechanical and Adhesive Anchors: Verify as per Chapter 17.8.2; periodic.

E. Anchors Installed in Hardened Concrete: Verify compliance with ACI 318, Sections 3.8.6, 8.1.3, and 21.2.8; periodic.

F. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI 318, Chapter 19, 16.4.3, 26.4.4; periodic.

G. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M and ACI 318, Sections 5.6 and 5.8 and record the following, continuous:
1. Slump.
2. Air content.
3. Temperature of concrete.
4. Verify use of required design mix.
5. Sample and test concrete during placement as follows. Test shall be taken at point of discharge into structure:

a. Record specific locations where concrete was placed. Refer to column lines where possible.
b. For each truck, record time concrete is batched as shown in truck ticket, time placement begins/sample time, and time truck is emptied.
c. For each truck, sample fresh concrete in accordance with ASTM C 172, except modified for slump to comply with ASTM C 94.
d. For each truck, perform slump test in accordance with ASTM C 143. Perform two slump tests for pumped concrete; one at truck and one at point of discharge.
e. For each truck for self-consolidating concrete, measure slump flow and record visibility stability index in accordance with ASTMC 1611/C 1611M. Slump cone may be in the upright or inverted position. Use same cone position for the entire project for consistency.
f. For normal-weight concrete, measure air content in accordance with ASTM C 231, pressure method. For lightweight concrete, measure air content in accordance with ASTM C 173, volumetric method. Perform one test for each truck for air-entrained and non-air-entrained concrete.
g. Record temperature of concrete for each truck. Test in-place concrete temperature hourly when ambient temperature is 40 degrees F and below and when 80 degrees F and above.
h. Record air temperature and general weather conditions (cloudy, windy, sunny, etc.).
i. Record unit weight of fresh normal-weight concrete in accordance with ASTM C 138. Record unit weight of lightweight concrete in accordance with ASTM C 567. Perform one test for each 50 cubic yard of concrete.
j. Perform concrete compressive tests as follows:
    a) Prepare compressive test specimens in accordance with ASTM C 31. Take a set of four - 6" x 12" cylinders for each 50 cubic yards of concrete or each 5,000 square feet of slab area for each type of concrete. Store undisturbed in insulated box during cold weather. Deliver to laboratory between 16 and 32 hours after making. Perform compressive tests in accordance with ASTM C 39: one 6 x 12 specimens tested at 7 days, two 6 x 12 specimens tested at 28 days, and one 6 x 12 specimens retained for later testing if required.
    b) In cold weather or whenever steel erection is scheduled to commence less than 14 days after placement of supporting foundation concrete, cast additional set of four - 6" x 12" cylinders for each 50 cubic yard or fraction thereof of supporting foundation concrete. Field-cure cylinders, and test two 6 x 12 specimens at 7 days, retaining two 6 x 12 specimens for later testing if required. Steel erection may not begin until supporting concrete obtains 75 percent of its design strength. Contractor, at their cost, may perform additional tests to determine concrete strength.
k. If concrete will be placed in separate buildings on a given project, make individual compressive strength test cylinders for each building.
l. Perform additional testing as follows if required:
    a) If total time period between batching and completing placement has exceeded ACI-recommended, 90-minute-maximum time limit the batch shall be rejected..

6. Inspect concrete placement for proper application techniques.
7. Inspect for maintenance of specified curing temperature and techniques.
8. Perform moisture vapor emission and alkalinity testing in accordance with ASTM F 1869 and ASTM F 710, respectively, as follows:
    a. Perform testing after building is enclosed, prior to installation of adhered floor finishes, and once HVAC systems are operational.
    b. Test results must be reviewed and accepted by floor finish installer.

H. Concrete and Shotcrete Placement:: Verify application techniques comply with approved contract documents and ACI 318, Sections 5.9 and 5.10; continuous.

I. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI 318, Section 6.1.1; periodic.

J. Materials: If the Contractor cannot provide sufficient data or documentary evidence that concrete materials comply with the quality standards of ACI 318, the AHJ will require that the Special Inspector verify compliance with the appropriate standards and criteria in ACI 318, Chapter 3.

K. Inspect size, spacing cover positioning and grade of reinforcing steel., verify that the reinforcing bars are free from oil and other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters

3.5 SPECIAL INSPECTIONS FOR MASONRY CONSTRUCTION

A. Masonry Structures Subject to Special Inspection:
   1. Masonry construction when required by the quality assurance program of TMS 402/602.
   2. Empirically designed masonry, glass unit masonry and masonry veneer in structures designated as "essential facilities".
      a. Perform inspections in accordance with Level B Quality Assurance.
   3. Engineered masonry in structures classified as "low hazard..." and "substantial hazard to human life in the event of failure".

B. Verify each item below complies with approved Contract Documents and the applicable articles of TMS 402/602.
   1. Inspections and Approvals:
      a. Verify compliance with the required inspection provisions of the approved Contract Documents; periodic.
      b. Verify approval of submittals required by Contract Documents; periodic.
      c. Verify Proportions of site-prepared mortar.
      d. Verify Proportions of site-prepared grout.
      e. Observe preparation of required mortar specimens, grout specimens, or prisms in accordance with ASTM C 780, ASTM C 1019, and ASTM C 1314 Rev B.
      f. Field Quality Control Testing: Perform tests and evaluations listed below during construction for each 5,000 square feet of wall area or portion thereof.
         a) Sample and evaluate mortar composition and properties in accordance with ASTM C 780.
         b) Sample and test grout compressive strength in accordance with ASTM C 1019.
   2. Compressive Strength of Masonry: Verify compressive strength of masonry units prior to start of construction unless specifically exempted by code; periodic.
   3. Slump Flow and Visual Stability Index (VSI): Verify compliance as self consolidating grout arrives on site; continuous.
   4. Joints and Accessories: When masonry construction begins, verify:
      a. Proportions of site prepared mortar; periodic.
      b. Construction of mortar joints; periodic.
      c. Location of reinforcement, connectors, and anchorages, etc; periodic.
   5. Structural Elements, Joints, Anchors, Protection: During masonry construction, verify:
      a. Size and location of structural elements; periodic.
      b. Type, size and location of anchors, including anchorage of masonry to structural members, frames or other construction; periodic.
      c. Size, grade and type of reinforcement, anchorages, and anchor bolts; periodic.
      d. Welding of reinforcing bars; continuous.
      e. Preparation, construction and protection of masonry against hot weather above 90 degrees F (50 degrees C) and cold weather below 40 degrees F (22 degrees C); periodic.
   6. Grouting Preparation: Prior to grouting, verify:

a. Grout space is clean; periodic.
b. Correct placement of reinforcing, connectors, prestressing tendons and anchorages; periodic.
c. Correctly proportioned site prepared grouts; periodic.
d. Correctly constructed mortar joints; periodic.

7. Preparation of Grout Specimens, Mortar Specimens and Prisms: Observe preparation of specimens; periodic.

3.6 SPECIAL INSPECTIONS FOR SOILS

A. Materials and Placement: Verify each item below complies with approved construction documents.
1. Design bearing capacity of material below shallow foundations; periodic.
2. Identify soils requiring undercutting and replacing while observing proof rolling and when subgrade is exposed.
3. Verify footing bearing strata.
4. Review and accept materials proposed by Contractor for use as compacted fill based on test data and information submitted by Testing Agency. Material approval shall be based on requirements and recommendations stated in documents.
5. Design depth of suitability of material at bottom of footings; continuous.
6. Design depth of excavations and suitability of material at bottom of excavations; periodic.
7. Materials, densities, lift thicknesses; placement and compaction of backfill: Continuous.
8. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.
9. Observe and accept preparation of slab-on-grade subgrade and subbase.

B. Testing Agency shall perform field density tests for building subgrades and for fill materials including slab subbase within building area in accordance with ASTM D 6938 as follows:
1. Testing: Classify and test excavated material; periodic.
2. Footing subgrade and each stratum of soil on which footings will be placed.
3. Building subgrade including slab subbase and each lift of compacted material.
4. Inspect each subgrade and fill layer before further backfill or construction work is performed. Approval shall be based on satisfactory achievement of compaction criteria.
5. Verify use of fill material and lift thicknesses in field.
6. Perform moisture content testing of slab subbase in accordance with ASTM D 6938.

C. Pier Foundations:
1. Special Inspector shall perform inspections and verifications and coordinate the documents to perform inspections and verifications including the following:
a. Review pier location plan provided by Contractor.
b. Review records of load test results provided by Contractor.
c. Inspect pier reinforcement prior to installation.
d. Verify acceptable bearing strata and depths have been reached during installation.
e. Maintain installation records.
2. Testing Agency shall sample fresh concrete and perform compressive strength testing in accordance with Cast-In-Place Concrete section of this specification.

3.7 Special Inspections for Vertical Masonry Foundation Elements

A. Vertical Masonry Foundation Elements are subject to the same special inspection requirements listed in the "Special Inspections for Masonry Construction" Article of this section.

3.8 Special Inspections for Sprayed Fire Resistant Materials

A. Sprayed Fire Resistant Materials, General:
1. Verify compliance of sprayed-fire resistant materials with specific fire-rated assemblies indicated in approved Contract Documents, and with applicable requirements of the building code.

2. Perform special inspections after rough installation of electrical, mechanical, plumbing, automatic fire sprinkler and suspension systems for ceilings.

B. Physical and visual tests: Verify compliance with fire resistance rating.
1. Condition of substrates; periodic.
2. Thickness of sprayed fire resistant material; periodic.
3. Density of sprayed fire resistant material in pounds per cubic foot (kg per sq m); periodic.
4. Bond strength (adhesion and cohesion); periodic.
5. Condition of finished application; periodic.

C. Structural member surface conditions:
1. Inspect structural member surfaces before application of sprayed fire resistant materials; periodic.
2. Verify preparation of structural member surfaces complies with approved Contract Documents and manufacturer's written instructions; periodic.

D. Application:
1. Ensure minimum ambient temperature before and after application complies with the manufacturer's written instructions; periodic.
2. Verify area where sprayed fire resistant material is applied is ventilated as required by the manufacturer's written instructions during and after application; periodic.

E. Thickness: Verify that no more than 10 percent of thickness measurements taken from sprayed fire resistant material are less than thickness required by fire resistance design in approved Contract Documents. In no case shall the thickness of the sprayed fire resistant material be less than the minimum below.
1. Minimum Allowable Thickness: Tested according to ASTM E605/E605M, periodic.
   a. Design thickness 1 inch (25 mm) or greater: Design thickness minus 1/4 inch (6.4 mm).
   b. Design thickness greater than 1 inch (25 mm): Design thickness minus 25 percent.
2. Floor, Roof and Wall Assemblies: Test thickness according to ASTM E605/E605M with no less than four measurements per 1,000 square feet (93 sq m) of sprayed area on each story of the structure or portion thereof; periodic.
   a. Cellular Decks: Measure thickness within a single 12 inch by 12 inch (305 mm by 305 mm) area. Make a minimum of four measurements arranged symmetrically in testing area.
   b. Fluted Decks: Measure thickness within a single 12 inch by 12 inch (305 mm by 305 mm) area. Make a minimum of four measurements arranged symmetrically in testing area and include one example each of valley, crest and sides. Report the average of the four measurements.
3. Structural Members: Test according to ASTM E605/E605M. Test no less than 25 percent of structural members on each story of the structure or portion thereof; periodic.
   a. Beams and girders: Make nine thickness measurements around beam or girder at each end of a 12 inch by 12 inch (305 mm by 305 mm) length.
   b. Joists and trusses: Make seven thickness measurements around joist or truss at each end of a 12 inch by 12 inch (305 mm by 305 mm) length.
   c. Wide flanged columns: Make twelve thickness measurements around column at each end of a 12 inch by 12 inch (305 mm by 305 mm) length.

F. Density: Verify density of sprayed fire resistant material is no less than density required by the fire resistance design in the approved Contract Documents.
1. Floor, Roof and Wall Assemblies: Test according to ASTM E605/E605M with no less than one sample per 2,500 square feet (232 sq m) of sprayed area on each story of the structure or portion thereof; periodic.

2. Beams, Girders, Trusses and Columns: Test according to ASTM E605/E605M with no less than one sample per 2,500 square feet (232 sq m) of sprayed area on each story of the structure or portion thereof; periodic.

G. Bond Strength: Verify adhesive and cohesive bond strength of sprayed fire resistant materials is no less than 150 pounds per square foot (7.18 kPa) when in-place samples of the cured material are tested according to ASTM E736/E736M and as described below.
1. Floor, roof and wall assemblies: Test no less than one sample per each 2,500 square feet (232 sq m) of sprayed area on each story of the structure or portion thereof; periodic.
2. Structural members: Test no less than one sample from each type of structural member in each 2,500 square feet (232 sq m) of each story of the structure or portion thereof; periodic.
3. Primer, paint and encapsulant bond tests: When sprayed fire resistant material is applied to a primed, painted or encapsulated surface for which acceptable material to substrate performance has not been determined, conduct bond test.

3.9 SPECIAL INSPECTIONS FOR FIRE RESISTANT PENETRATIONS AND JOINTS

A. Verify penetration firestops in accordance with ASTM E2174.

B. Verify fire resistant joints in accordance with ASTM E2393.

3.10 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspector shall:
1. Attend preconstruction meetings and progress meetings.
2. Submit reports of all tests or inspections specified.
3. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
4. Provide qualified personnel at site. Cooperate with Owner’s Representative and Contractor in performance of services.
5. Perform specified sampling and testing of products in accordance with specified reference standards.
6. Ascertain compliance of materials and products with requirements of Contract Documents.
7. Promptly notify Owner’s Representative and Contractor of observed irregularities or non-conformance of work or products.Owner
8. Perform additional tests and inspections required by Owner’s Representative.
9. Attend preconstruction meetings and progress meetings.
10. Submit reports of all tests or inspections specified. Reports shall include:
a. Project Name.
b. Owner Name.
c. Inspector Name.
d. Special Inspector.
e. Statement stating the testing, inspection in conformance with these requirements and any discrepancies have been identified and corrected.
f. Comments or other information.

B. Limits on Special Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Owner’s Representative.

D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.11 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Owner's Representative in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Owner's Representative and Architect of observed irregularities or non-conformance of work or products.
   5. Perform additional tests and inspections required by Testing Agency, Special Inspector, and AHJ.
   6. Attend preconstruction meetings and progress meetings.
   7. Submit reports of all tests or inspections specified within maximum of one (1) week.

B. Limits on Testing or Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the work.

C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Owner's Representative.

D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.12 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities, General:
   1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
   2. Maintain contract set of Construction Drawings, field sketches, accepted shop drawings, and specifications at project site for field use by Inspectors and Testing Technicians.
   3. Cooperate with Special Inspector agency and laboratory personnel; provide access to the work, to manufacturers' facilities, and as required.
   4. Provide incidental labor and facilities:
      a. To provide access to work to be tested or inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
      c. To facilitate tests or inspections.
      d. To provide storage and curing of test samples.
   5. Notify Owner's Representative and laboratory three (3) days prior to expected time for operations requiring testing or inspection services.
   6. Provide Special Inspector use of Contractor's scaffolding to access work areas,
   7. Arrange with Owner's Representative pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   8. As the work proceeds, perform remedial work, as directed and sign non-conformance reports stating remedial work has been completed to the Special Inspector.
   9. Retain special inspection records.

3.13 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, and to initiate instructions when necessary.

B. Submit qualifications of observer to Owner’s Representative 30 days in advance of required observations.
   1. Observer subject to approval of Owner’s Representative .

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

Approved Agency's Final Report of Special Inspections

Project Name: _____ Special Inspector: _____

Location: _____ Special Inspector Project No.: _____

Owner: _____ Architect of Record: _____

Owner Address: _____

Structural, Mech, Electrical, or Site RDP: _____

Fuller & D'Angelo Project No.: _____

To the best of my information, knowledge, and belief, the Special Inspections and testing required for this project and designated for this Agent in the Statement of Special Inspections (which includes Specification Section 014533 and the Schedule of Special Inspections) have been performed and discovered discrepancies have been reported and resolved except for the following:

Comments:

Attach continuation sheets if required to complete description of uncorrected discrepancies.

Respectfully submitted,

Agent of the Special Inspector: _____

Type or Print Name Title

Signature_____ Date: _____

Address: _____

City , State, Zip:_____

Professional Seal

Final Report of Special Inspections

Project Name: _____ Approved Agency: _____

Location: _____ Approved Agency Project No.: _____

Owner: _____ Special Inspector: _____

Owner Address: _____

Designer of Record: _____

A.

To the best of my information, knowledge, and belief, Special Inspections required for this project, as indicated in the Statement of Special Inspections, (which includes Specification Section 01 4533 and the Schedule of Special Inspections) have been performed and discovered discrepancies have been reported and resolved except for the following:

Comments:

(Attach continuation sheets if required to complete description of uncorrected discrepancies.)

Interim reports submitted prior to this Final Report form a basis for and are to be considered an integral part of this Final Report. Upon request, the interim Testing and Special Inspection reports can be provided. Agent's Final Reports of Special Inspections are attached and are also a part of this Final Report.

Submitted By: _____

(Type or print name)

_____

Signature Date

Professional Seal

APPROVED AGENCY NON CONFORMANCE LOG

Project: _____

Project No.: _____

Non-Conformance Item # (See Note 1)	Special Report No. Reference /Date	Summary of Non-Conformance	Date SEOR Response Received within 24 hr	Reinspection Required	Date Contractor Verification Received (See Note 1)	Status (See Note 2)
NC-1						
NC-2						
NC-3						
NC-4						
NC-5						
NC-6						
NC-7						

1. New items are in bold. For each non-conformance item above, the general contractor or subcontractor must sign and submit the contractor verification statement located in the RDP response report**.**

2. Non-conformance items remain" open" until the contractor verification have been received. When the signed verifications have been received by the RDP, the item will be " closed" distributed with 7 days

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Dewatering
B. Temporary utilities.
C. Temporary telecommunications services.
D. Water service and distribution.
E. Temporary electric power and light.
F. Temporary heat.
G. Ventilation.
H. Temporary telephone service.
I. Temporary sanitary facilities.
J. Temporary Controls: Barriers, enclosures, and fencing.
K. Storage shed
L. Temporary enclosures.
M. Hoists and temporary existing elevator use (if any).
N. Waste removal facilities and services.
O. Construction aids and miscellaneous services and facilities.
P. Sidewalk bridges.
Q. Enclosure fence for the construction areas.
R. Environmental protection.
S. Snow Removal.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements for submittals.
B. Section 01 3553 - Site Safety and Security Procedures
C. Section 01 5050 - Pipe Scaffolding and Sidewalk Bridges
D. Section 01 5213 - Field Offices and Sheds.
E. Section 01 5400 - Temporary Fabric Structures.
F. Section 01 5500 - Vehicular Access and Parking.
G. Section 01 5719 - Environmental Protection During Construction.
H. Section 01 5813 - Temporary Project Signage.
I. Section 01 7000 - Execution: Requirements for progress cleaning requirements.
J. Divisions 2 through 40 temporary heat, ventilation, and humidity requirements for products in those Sections.
K. Division 31 Earthwork for disposal of ground water at Project site.
L. Division 32 Asphalt Unit Paving" for construction and maintenance of asphalt paving for temporary roads and paved areas.

1.4 REFERENCE STANDARDS

A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.5 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

1.6 DEFINITIONS

A. Permanent Enclosure: As determined by Construction Manager, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.7 REFERENCES

A. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Refer to guidelines for Bid Conditions for “Temporary Job Utilities and Services” as prepared jointly by AGC and ASC for recommendations.

1.8 SITE PLAN:

A. Show exiting fencing, temporary facilities , utility hookups, staging areas, and parking areas for construction personnel.

1.9 REPORTS AND PERMITS:

A. During the progress of the Work, each prime contractor shall submit copies of reports and permits required by governing authorities, or necessary for the installation and efficient operation of temporary services and facilities.

B. Submit copies of reports of tests, inspections, and similar procedures performed on temporary utilities before, during and after performance of work. Submit copies of permits, easements and similar documentation necessary for installation, use and operation of temporary utility services.

1.10 QUALITY ASSURANCE

A. Regulations: Each 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: Each 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."

C. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

D. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.11 PROJECT CONDITIONS

A. General: Each contractor shall provide each temporary service and facility ready for use at each location, when first needed to avoid delays in performance of work. Maintain, expand as required, and modify as needed throughout the progress of the work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

1. With the establishment of the job progress schedule, each contractor shall establish a schedule for implementation and termination of service for each temporary utility. At the earliest feasible time, and when acceptable to the Construction Manager, change over from use of temporary utility service to use of the permanent service, to enable removal of temporary utilities and to eliminate possible interference with completion of the Work.

B. Temporary Use of Permanent Facilities: Regardless of previously assigned responsibilities for temporary services and facilities, the Installer of each permanent service or facility shall assume responsibility for its operation, maintenance and protection during use as a construction service or facility prior to the Construction Manager's acceptance and operation of the facility.

C. Conditions of Use: Operate temporary services and facilities in a safe and efficient manner. Do not overload, and do not permit temporary services and facilities to interfere with the progress of work, or occupancy of existing facility by owner. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

D. Temporary Utilities: Do not permit freezing of pipes, flooding or the contamination of water sources.

E. Temporary Construction and Support Facilities: Maintain temporary facilities in a manner to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary facilities in a sanitary manner so as to avoid health problems.

F. Security and Protection: Maintain site security and protection facilities in a safe, lawful, publicly acceptable manner. Take measures necessary to prevent site erosion.

1.12 TEMPORARY UTILITIES

A. Owner will provide, for the Contractor(s) use, the following:
   1. Electrical power, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. The responsible Contractor shall provide and pay for all electrical power, lighting, water, and ventilation required for construction purposes.

C. Existing facilities may be used.

D. New permanent facilities may be used when approved by the Construction Manager.

E. Use trigger-operated nozzles, with back flow devices, for water hoses, to avoid waste of water.

F. Engage the appropriate local utility company to install temporary 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.
   1. Arrange with the company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
   2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
      a. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose

1.13 DIVISION OF RESPONSIBILITIES

A. **Each contractor is responsible for the following:**
   1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each facility.
   2. Plug-in electric power cords and extension cords.
   3. Supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
   4. Special power requirements for installation of its own work such as welding.
   5. Its own field office complete with necessary furniture, utilities, and telephone service.

6. Its own storage and fabrication sheds.
7. All hoisting and scaffolding for its own work.
8. Collection and disposal of its own hazardous, dangerous, unsanitary, or other harmful waste material.
9. Collection and disposal of major equipment removed such as boilers, unit ventilators , fans, toilet fixtures, and light fixtures.
10. Collection of general waste and debris and disposing into containers provided by Contract #1, General Construction Contractor.
11. Secure lockup of its own tools, materials and equipment.
12. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

1.14 GENERAL CONSTRUCTION CONTRACTOR CONTRACT #1

A. The General Construction Contractor is responsible and pays all costs for all contracts the following, :
1. Temporary roads and paving.
2. Temporary toilets and wash facilities, including disposable supplies.
3. First Aid Station and Supplies.
4. Containers for non-hazardous waste and debris.
5. Temporary enclosure of the building.
6. Disposal of wastes containers.
7. Barricades, warning signs, and lights.
8. Site/construction enclosure fence.
9. Sidewalk bridges and Pipe Scaffolding.
10. Security enclosure and lockup.
11. Environmental protection.
12. Temporary Fire Protection
13. Temporary Protection for existing flooring, from altered areas to exits.
14. Construction aids and miscellaneous services and facilities.
15. Temporary dustproof partitions.
16. Temporary dust control.
17. Dewatering facilities and drains.
18. Snow Removal.
19. Temporary heat (See paragraph 1.33)

1.15 PLUMBING CONTRACTOR CONTRACT #2

A. Water Service: The Plumbing Contractor Contract #2 shall provide and pay all costs to install distribution piping of sizes and pressures adequate for construction for all contracts .
1. Applicability: This paragraph applies to all renovation and new construction work areas for this Project.
2. Obtain water service from the nearby water main of the local water authority, as permitted by the governing authority, or use owner's existing if adequate for temporary facilities.
3. As soon as construction operations start provide water, extend service, the full height of the building to form a temporary water. Provide distribution piping for temporary water to each location of use. Provide one outlet for each level of construction spaced so that water can be reached with a 100 foot length of hose. Provide one 3/4" flexible rubber hose 100 feet long with an adjustable nozzle, at each outlet where work requiring water is in progress.
4. Provide backflow devices on all devices and hoses etc. to prevent water from re-entering the potable system.

5. Maintain hose connections and outlet valves in leak-proof condition. Where finish work below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize the possibility of water damage. Drain water promptly from drip pans as it accumulates.
6. Protection: Prevent water filled piping from freezing, by use of ground covers, insulation, by keeping drained, or electrical tape. Maintain distinct markers for underground lines. Protect from damage during excavation operations
7. Maintaining existing domestic hot and cold water systems, sanitary and storm systems, fire protection systems within the existing building operational at all times for Owner ‘s occupancy and during construction.

1.16 MC MECHANICAL CONTRACTOR CONTRACT #3 (HVAC).

A. The MC Contractor Contract #3 is responsible for maintaining existing heating system in service during the period between September 15 and June 15. MC Contractor shall provide all piping, valves, controls, etc., and labor and materials required to maintain operation of existing heating system where affected by the work. Refer to paragraph 1.33 and 1.34 for additional requirements.

1.17 ELECTRICAL CONTRACTOR CONTRACT #4

A. Temporary Electric Power Service: Electrical Contractor Contract #4 shall provide and pay all costs to provide a weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate performance of work during the construction period **for all contracts .**

1. Applicability: This paragraph applies to all renovation and new construction work areas for this Project.
2. The Electrical Contractor shall make arrangements with utility company for temporary and permanent services immediately after award of contract, where required.
3. Connect temporary service to Owner's existing main in the manner directed by Construction Manager.
4. Temporary or permanent services for temporarily or permanently installed building equipment such as sump pumps, boilers, cabinet heating and/ or cooling units and fans shall be furnished, installed, operated and maintained so that the said equipment may be operated for drainage and temporary heat when required and/or when so ordered by the Construction Manager
5. Electrical Contractor shall maintain all parts of the electrical system temporary and permanent active and in-service at all times throughout the contract duration. All temporary lighting and power to be controlled by standard switches per code (outside of power panels) at no additional charge.
6. Temporary Service: Install service and grounding in compliance with the National Electric Code (NFPA 70). Include necessary meters, transformers, overload protected disconnect and main distribution switch gear. Comply with all NECA, NEMA and UL Standards.
7. Provide temporary service with an automatic ground-fault interrupter feature, activated from the circuits of the system.
8. Power Distribution System: Provide circuits of adequate size and proper characteristics for each use. In general run wiring overhead. Rise vertically where wiring will be least exposed to damage from construction operations.
9. Contractor shall provide temporary generator power to maintain power to critical circuits during main electric service switch over. Critical circuits shall include fire alarm, emergency lighting, communication, information technology, etc.. Coordinate required circuits with owner. Contractor shall include required fuel for operation.
10. If the Owner's existing service is inadequate the Contractor shall make arrangements with the local utility company for temporary service and provide generators and temporary panels as necessary. Generators shall be located at the building exterior. Provide feeder cables, adequately sized, in accordance with NEC to feed temporary panels or existing sub-panels.

11. Provide metal conduit, tubing or armored cable for protection of temporary power wiring where exposed to possible damage during construction operations. where permitted by code, wiring of circuits not exceeding 110-120 Volt 20 Amp rating and wiring of lighting circuits may be non-metallic sheathed cable in areas where located overhead and exposed. Do not wire temporary lighting with plain, exposed (insulated) electrical conductors. Provide metal enclosures or boxes for wiring devices.
12. Provide overload-protected disconnect switch as required by code.
13. For power hand tools and task lighting, provide temporary 4-gang outlets at each floor level, spaced so that a 100 foot extension cord can reach each work area. Provide separate 110-120 Volt, 20 Amp circuit for each 4-gang outlet (4 outlets per circuit). GFCI protected.
14. Temporary electric power for Construction Manager field office.
    a. Refer to Section 01 5213 - Field Offices and Sheds.
15. Temporary power for sidewalk bridges.
16. Temporary power for corridors, stairways and other exit ways.

B. Temporary Lighting: Electrical Contractor Contract #4 shall provide and pay all costs to provide local switching of temporary lighting, spaced to allow lighting to be turned off in patterns to conserve energy, retain light suitable for work-in-progress, access traffic, security check and project lock-up to accommodate performance of work during the construction period for all Contracts. .
    1. Provide not less than on 200-watt lamp per 400 sq. ft. of floor area, uniformly distributed, for general construction lighting, or illumination of a similar nature.
        a. In corridors and similar traffic areas provide one 100-watt incandescent lamp every 50 feet.
        b. In stairways and at ladder runs, provide one lamp per story, located to illuminate each landing and flight.
        c. Provide separate circuitry for corridors, stairways and other travel exits.
    2. Operate corridors, stairways and other travel exits 24 hours per day 7 days per week on each level.
        a. Install and operate temporary lighting to fulfill security and protection requirements, without the necessity of operating the entire system
    3. Temporary lighting for sidewalk bridges.
    4. Temporary lighting, pole mounted, with directional lighting to adequately illuminate all staging staging areas and adjustable so that lighting does not illuminate directly toward existing adjacent residences or student spaces.
    5. Temporary power for Owner trailer.
    6. Temporary lighting for Fabric Structure.

C. Whenever an overhead floor or roof deck has been installed, install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every work area

D. Temporary light and power shall be provided 15 minutes before the normal scheduled daily start of any trade and 15 minutes after the normal schedule daily completion of the last trade, except where 24 hour operation is indicated.
    1. Electrical Contractor shall maintain power and lighting during the normal work week during the hours established by Construction Manager whether or not they fall within established working hours.

1.18 MAXIMUM LOADS

A. General: Lighting and power loads connected to the temporary power distribution system shall be limited to the following maximum individual loads:

1.	Load	Type	Maximum Size
2.	120 volt	1-phase	1.5 KVA
3.	208 volt	1-phase	2.5 KVA
4.	208 volt	3-phase	5.0 KVA

B. General: The temporary power distribution system shall be sufficiently sized to provide temporary power as required within this section. Meter and Meter connections to be part of electrical contractor.

1.19 ELECTRIC WELDERS

A. Separate Power Sources Required: Power for electric welders and for other loads larger than the maximum allowable sizes shall be taken from portable power sources provided, paid for and operated by the Contractor or Sub-Contractor requiring the use of such equipment. Remove such power sources when no longer needed.

1.20 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to the Owner, Architect, and Construction Manager. The Owner, Architect, and Construction Manager will not accept a 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.
   1. Water Service Use Charges: Water from the Owner's existing water system may be used without metering, and without payment for use charges.
   2. Electric Power Service Use Charges: Electric power from the Owner's existing system may be used without payment of use charges. Contractor and Sub-Contractors shall exercise measures to conserve energy usage.
      a. Use of owner electric for items not specific to project (e.g. heating construction shanties, etc.) will not be permitted.
   3. All temporary lighting and power to be controlled by standard switches per code (outside of power panels) at no additional charge.
   4. Temporary Utility Services: Where Owner's existing services is inadequate or would disrupt owners use of the existing facility, contractor shall provide utility services for the temporary use at the project site from the utility company, and pay all costs, including use charges.
   5. The Electrical Contractor is responsible for providing adequate utility capacity at each stage of construction for temporary services required under its contract. Prior to availability of temporary utility services at the site, provide trucked-in services for start up of construction operations.
   6. Contractor may elect to use alternative temporary services and facilities equivalent to those specified, subject to acceptance by the Construction Manager.

1.21 TELECOMMUNICATIONS SERVICES

A. Each contractor shall provide and pay for its own telephone service. Provide mobile phone service for all field superintendents and foreman.

B. At each telephone post established be each contractor, a list of important telephone numbers, including the following:
   1. Local police and fire department.
   2. Doctor.
   3. Ambulance service.
   4. Contractor's temporary and home office.
   5. Owner's Representative temporary and home office
   6. Architect's home office.
   7. Engineer's home office.
   8. Owner's home office.
   9. Principal subcontractors temporary and home office

1.22 TEMPORARY SANITARY FACILITIES

A. Responsibilities: The General Construction Contractor, Contract #1, is responsible for temporary sanitary facilities and their maintenance, including supplies, for all contractors :

B. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

C. Toilets: Use of the Owner's existing toilet facilities will not be permitted

D. Maintain daily in clean and sanitary condition.

E. At end of construction, return facilities to same or better condition as originally found.

F. Sanitary Facilities: Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations which will best serve the project's needs.

G. Locate toilets so that no one within the construction area will need to walk more than 2 stories vertically or 200 feet horizontally to reach these facilities.

H. Install self-contained toilets to the extent permitted by governing regulations.

I. Supply and maintain toilet tissue, paper towels and other disposable materials as appropriate for each facility, for full contract duration. Provide covered waste containers for used material.

J. Provide separate toilet facilities for male and female construction personnel.

K. Janitorial Services: Provide janitorial services for Construction Manager's temporary offices, toilets, and similar areas. Require users of other temporary facilities to help maintain a clean and orderly premises.

1.23 BARRIERS

Responsibility: General construction barriers required for the project shall be the responsibility of the General Construction Contractor, Contract #1 **all Contracts.**

A. Barricades, Warning Signs and Lights: Comply with recognized standards and code requirements for erection of substantial, structurally adequate barricades where needed to prevent accidents and losses. Paint with appropriate colors, graphics and warning signs to inform personnel at the site and the public, of the hazard being protected against. Provide lighting where appropriate and needed for recognition of the facility, including flashing red lights where appropriate

1. Sign Materials: For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated. Provide exterior grade acrylic-latex-base enamel for painting sign panels and applying graphics.

B. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and removals.

C. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

D. Plywood: For safety barriers, sidewalk bridges and similar direct-contact uses, provide exterior type, 5/8" thick minimum prime and finish painted plywood.

1.24 SIDEWALK BRIDGE

A. Sidewalk Bridge: General: Erect a substantial structurally adequate protective bridge for passage of persons along exits from existing building when overhead work is being performed. Coordinate with project entrance gates and other facilities and obstructions. Comply with governing regulations and requests of governing authorities

1. Responsibility: Sidewalk bridge required for the project shall be the responsibility of the General Construction Contractor.
   a. Prior to start of construction construct sidewalk bridges where shown on drawings.
2. Construct sidewalk bridges using steel post and beams. Brace and securely attach all components.
   a. Side walk shall be designed for live load of 100 lbs/sf. and meet the following minimum requirements:
   b. Posts - 3 ½” standard pipe spaced 8' o.c. longitudinally.
   c. Beams -Structural steel dependent upon sidewalk width and live load.

d. Joists -Structural steel or 3” x 6” to 4” x 8” timber, dependent upon joist spacing and live load.
e. Decking - 2” to 3” thick planking, dependant upon joist framing and live load.
f. Waterproofing - 22 gauge corrugated steel fastened below the decking.
g. Parapet - ¼” plywood on 2” by 4” framing.
h. Bracing - 1 ½” standard pipe for grits and railings, ¾ standard pipe or tube for X - bracing.
i. Sills - 2” x 10” on the pavement or continuous 5” x 12” on soil.
j. Fence - ¼” plywood.
k. The bridge shall be braced longitudinally and horizontally with X-bracing every fifth bay and each end bay. Transverse bracing is provided 8' o.c. at post beam junctions. Connections shall be made with clamps.

3. Sidewalk bridges required exclusively for each prime contractor are the responsibility of that contractor.

B. Temporary Lighting:
1. Electrical Contractor shall provide temporary lighting for sidewalk bridges. Refer to paragraph 1.17.

C. Provide protection for plants designated to remain. Replace damaged plants.
1. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.25 FENCING

A. Enclosure Fence: General: Prior to start of excavation or other substantial elements of work begin, install a general enclosure fence with suitable lockable entrance gates. Locate where indicated, or if not indicated, enclose the entire site or the portion of the site determined to be sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except through entrance gates.
1. The General Construction Contractor, Contract #1, shall provide, maintain and pay all costs for temporary fencing for all contractors until directed to remove fence by the, Construction Manager from the site..

B. Construction: Commercial grade chain link fence.

C. Provide 8 foot (- m) high fence around construction site; equip with vehicularand pedestrian gates with locks.

D. Locate where indicated, or if not indicated, enclosed portions of the site determined to be sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except through entrance gates.
1. Material:
a. Steel fencing: Galvanized Chain Link and galvanized gates (non-climbable size).
b. Fabric: No.11GA galvanized, steel wire mesh, furnish one-piece fabric widths for fencing up to 12' in height indicated in the Contract Documents.
c. Framing and Accessories: End, Corner and Pull posts: 2.375" OD steel pipe.
d. Line Posts: Space 10'-0" O.C. maximum. 1.90" steel pipe or 1.875" x 1.625 C-sections.
e. Fence Rails: Locate at top and bottom of fabric. Post brace assembly - manufacturer's standard.
f. Wire ties: For tying fabric to line posts use wire ties spaced 12" O.C.
g. Height: 8'
h. Provide opaque fabric screening over fence mesh to obstruct view from and to the construction zone. Heavy duty knitted polyethylene 88% opaque to allow for air passage. (Color: green.) As manufactured by "Fence screen", Series 200 or approved equal.

2. Excavate hole depths approximately 3" lower than post bottom; with bottom of posts set not less than 36" below finish grade surface. The line post holes will be 16" in diameter and 3'-9" in depth filled with set in a compacted mixture of gravel and earth.
    a. Self-supporting fence with movable bases may not be used except where the proposed temporary fence location is on top of existing paved surfaces.

1.26 EXTERIOR ENCLOSURES

A. Responsibilities: General Construction, Contract #1, is responsible for temporary enclosure for for all contractors.

B. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

C. At the earliest practical time provide temporary enclosure of materials, equipment, work in progress and completed portions of work to provide protection to the Work and employees from effects of exposure, foul weather, other construction operations, and similar activities on the site.

D. Provide temporary enclosures where temporary heat is needed and permanent building enclosure is not yet completed, and there is no other provision for containment of temporary heat. Coordinate enclosures with ventilating and material drying or curing requirements to avoid dangerous conditions and adverse effects.

E. Enclosure: Install tarpaulins or equivalent materials securely, using a minimum of metal framing, 4" - 20 ga. metal framing 16" o.c., and ½" plywood plus 6 mil poly for secure and weather tight protection of the school. Individual openings of 16-sq. ft. or less may be closed with plywood or similar materials.
    1. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures where work is being or will be performed, provide translucent tarpaulins made of nylon reinforced laminated polyethylene to admit the maximum amount of daylight and reduce the need for temporary lighting

F. Close openings through the floor or roof decks and other horizontal surfaces with substantial load-bearing metal framing or similar construction

1.27 INTERIOR ENCLOSURES

A. Provide temporary dustproof partitions as indicated or required to separate work areas from Brewster Central School District-occupied areas, to prevent penetration of dust and moisture into Brewster Central School District-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and gypsum board sheet materials with closed joints and sealed edges at intersections with existing surfaces:

C. Paint surfaces exposed to view from Brewster Central School District-occupied areas.

D. Temporary Dustproof Partitions: General Construction Contractor shall provide dustproof partitions to separate work area from occupied sections of building unless indicated otherwise. Partitions shall be full height metal stud surfaced with minimum 1/2" Type X gypsum board with 2 layers of poly sheeting, overlapped and edges caulked.
    1. Where isolated work is being performed by a prime contractor the contractor performing the work shall be responsible for protecting the occupied areas from the work areas as directed by the Architect, including providing dust protection.
    2. Vertical Openings: Close openings of 25 sq. ft. (2.3sq. M) or less with plywood or similar materials.
    3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
    4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
    5. Where temporary wood or plywood enclosure exceeds 100sq. Ft. (9.2 sq. m) in area, use fire-retardant-treated material for framing and main sheathing.

E. Electrical Contractor shall remove and reinstall any devices impacted by temporary partition installation. At conclusion of project electrician will again remove and reinstall these devices onto the permanent locations

1.28 SITE SAFETY AND SECURITY PROCEDURES- See Section 01 3553

1.29 VEHICULAR ACCESS AND PARKING - See Section 01 5500

1.30 WASTE REMOVAL

A. See Section 01 7419 - Waste Management, for additional requirements.

B. General Construction Contractor, Contract #1, shall provide containers, at grade, to accommodate performance of work during the construction period **for all contracts.**

1. Provide specific containers for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
2. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
3. Contractors shall not utilize the Owner's bins or dumpsters.

C. General Construction Contractor, Contract #1, shall broom clean the work area at the end of each work day.

1. If the contractor fails to clean areas at the end of each work day the Construction Manager shall perform the cleaning and back charge the contractor at overtime rates plus 15%. Notice to agreed personell is deemed notice to the Prime COntractor. Contractors working after the normal work hours of the GC work hours, shall be responsible for their own clean up of any and all debris they generate after the GC has completed his daily clean up.

D. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

E. Provide containers with lids. Remove trash from site periodically.

F. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

G. Each prime contractor shall be responsible for daily cleaning up of spillage and debris resulting from its operations and from those of its subcontractors; and shall be responsible for complete removal and disposition of hazardous and toxic waste materials.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

H. Burying or burning of waste materials on the site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. Provide rodent proof containers located on each floor level to encourage depositing of garbage and similar wastes by construction personnel.

J. Site: Each Contractor shall maintain Project site free of waste materials and debris.

K. Installed Work: Keep installed work clean. Each Contractor shall 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.

L. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

M. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

N. General Construction, Contract #1 is responsibility for dust control for **all contracts.**

1. Methods of dust control include but are not limited to:
2. Adequate ventilation.
3. Wetting down

4. Keeping bags of insulating materials, cement, etc., closed.
5. Controlled mixing of materials.
6. Special attention to sawing of insulation and acoustic materials.
7. Proper storage of materials.
8. Continuos maintainance of proper housekeeping.
9. Advising all personell of hazardous conditions including supervisors and workmen.
10. Each Contractor is responsible to provide dust protection for their construction-related activities and to ensure minimal impact to surrounding occupied areas.

1.31 TEMPORARY PROJECT SIGNS - See Section 01 5813

1.32 FIELD OFFICES - See Section 01 5213

1.33 TEMPORARY HEAT

A. Temporary Heat: General: Provide temporary heat as required for proper performance of the Work, curing or drying of recently installed work or protection of work in place from adverse effects of low temperatures or high humidity. Select facilities known to be safe and without deleterious effect upon work in place or being installed. Coordinate with ventilation requirements to produce indicated ambient condition required and to minimize consumption of fuel or energy.
   1. All temporary heat required within the perimeter of the addition being erected, or within the completed or uncompleted walls of the building being erected, shall be the responsibility of the General Construction Contractor, Contract #1, and complete costs therefore shall be borne by them and included in the amount quoted in his proposal for all temporary heating described in this section.
   2. All temporary heat required within the perimeter of the existing building shall be maintained by the MC Contractor, Contract #3.
   3. The General Construction Contractor Contract #1, shall enclose the area within the perimeter of the building, or the required portion of that area, with temporary, legal and fire-resistant construction which will retain temporary heat within that area, if the exterior walls are not erected. He shall do so when directed by the Construction Manager in order to comply with the progress schedule, and to protect work or materials previously placed, being placed, or about to be placed from damage that could result from cold weather.
   4. All other contractors shall be responsible for temporary heat required to comply with the progress schedule and protect their work and materials on the site, but beyond the perimeter or beyond the completed or uncompleted walls of the building or buildings in this project.
   5. When the building or a section thereof is enclosed, or when temporary heating is required for the proper progress or protection of the work as determined by the Construction Manager the General Construction Contractor shall provide temporary heating.
   6. Maintain a minimum temperature of 55 deg. F in permanently enclosed portions of the building and areas where finished work has been installed. Refer to individual sections for more stringent requirements.
   7. Heating Facilities: Except where conditions make it necessary to use another system, provide properly vented self-contained LP gas heaters with individual space thermostatic control for temporary heat.
      a. Gasoline burning space heaters will not be permitted.
      b. Electric space heaters will not be permitted.
      c. Do not use open burning, electric or salamander type temporary heating units

B. Hoists and Temporary Elevator Use: .
   1. Each Contractor shall provide facilities for hoisting materials and employees. Do not permit employees to ride hoists which comply only with requirements for hoisting materials. Section of type, size and number of facilities is the Contractor's option. Truck cranes and similar devices used for hoisting are considered tools and equipment and not temporary facilities

2. Elevator Use: Owner's existing elevator may not be used by the Contractor.

1.34 MISCELLANEOUS PROVISIONS

A. Temporary Roof Drainage: The General Construction Contractor, Contract #1, shall provide temporary drainage until roofing or similar waterproof deck construction is completed and prior to connection and operation of permanent drainage piping system
   1. Dispose of rainwater in a lawful manner, which will not result in flooding of the project site or adjoining property, or endanger either permanent work or temporary facilities

B. Snow Removal: The General Construction Contractor, Contract #1, shall be responsible for the removal of snow from the contract area to included access roads, excavations, roof deck areas, roof areas, roof areas to provide access for roof curbs and equipment work, and exits from occupied areas to legal exitways for Contracts 2,3 and 4.
   1. Provide salting / sanding as required to keep staging area and all walking areas safe for foot traffic.
   2. Provide snow removal, salting, sanding at Construction Manager’s field office trailer and staging areas.

1.35 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection or when directed by theConstruction Manager .

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition.

D. Restore new permanent facilities used during construction to specified condition.

E. Replace air filters and clean the inside of ductwork and housings.

F. Replace significantly worn parts and parts that have been subject to unusual operating conditions.

G. Replace lamps in the lighting system that are burned out or dimmed by substantial hours of use

PART 2 PRODUCTS - NOT USED

2.1 DE - WATERING FACILITIES AND DRAINS

A. Each Contractor is directly responsible for de-watering their excavations. The responsibility of de-watering of the site as to facilitate the work will be the responsibility of the General Contractor Contract #1, coordinate with Construction Manager.
   1. Comply with requirements in applicable Division 1 Sections for temporary drainage and de-watering facilities and operations not directly associated with construction activities included in individual sections. Where feasible, use same facilities. Maintain project site, excavations, and construction free of water.
   2. Dispose of rainwater in a lawful manner that will not result in flooding project or adjoining property nor endanger permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
   3. Remove snow and ice as required to minimize accumulations

PART 3 EXECUTION -

3.1 TEMPORARY UTILITY INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.

B. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

3.2 CONTRACTOR FIELD OFFICES

A. All prime contractors and subcontractors may with permission from the Construction Manager establish a field office for their own use. Said offices for the individual prime contractors, sub contractors, specialty contractors and the like shall be of such size and design as approved by the Construction Manager and shall be located in a fenced staging area or where directed by the Construction Manager. Each representative contractor will arrange for telephone service and electric service, if required, directly with the utility company.

B. Maintain, in the contractors field office, all articles for First Aid treatment; further, the contractor shall establish standing arrangements for the immediate removal and hospital treatment of any employees and other persons on the job site who may be injured or who may become ill during the course work.

C. No interior work areas are to be used as office, storage or contractor staging.

3.3 STORAGE FACILITIES

A. Each Contractor and each subcontractor shall provide temporary storage shanties, tool houses and other facilities as required for his own use. Temporary structures shall be located at the fenced staging area, and shall be removed upon completion of the work or when directed.

B. Materials delivered to the site shall be safely stored and adequately protected against loss or damage. Particular care shall be taken to protect and cover materials that are liable to be damaged by the elements.

C. Due to limited on site storage space, each Contractor shall coordinate delivery of his materials with the Construction Manager who will determine when large deliveries shall be made and shall be designate storage locations on site for delivered materials. All stored materials must be stored in locked, watertight trailers, paid for by applicable contractor.

3.4 SCAFFOLDING AND STAGING

A. All scaffold, staging and appurtenances thereto shall comply in total to the requirements of Safety and Health Regulations for Construction Chapter XVII of OSHA, Part 1926 and all related amendments.

B. Scaffol Type HD - Heavy Duty, with multiple platform framed.

3.5 ROOF PROTECTION

A. All Contractors shall provide temporary protection on any newly installed or existing roof surface when it is necessary for work to take place on completed sections.

B. Upon such notification as required in subparagraph A, the Contractor shall assume responsibility for damages, if any, to the roofing system caused by the work of other trades, except that financial liability for any and all damages rests with the offending trade.

3.6 FIRE PREVENTION CONTROL

A. All Contractors shall comply with the safety provisions of the National Fire Protection Association's “National Fire Codes” pertaining to the work and, particularly, in connection with any cutting or welding performed as part of the work

3.7 TEMPORARY FIRE PROTECTION

A. Refer to Section 01 3553 - Site Safety and Security Procedures for additional requirements.

B. Each Contractor shall take all possible precautions for the prevention of fires. Where flame cutting torches, blow torches, or welding tools are required to be used within the building, their use shall be as approved by the Construction Manager at the site. When welding tools or torches of any type are in use, have available in the immediate vicinity of the work a fire extinguisher of the dry chemical 20 lbs. Type. The fire extinguisher(s) shall be provided and maintained by the Contractor doing such work.

C. Fuel for cutting and heating torches shall be gas only and shall be contained in Underwriters laboratory approved containers.

D. Storage of gas shall be in locations as approved by the Construction Manager and subject to Fire Department regulations and requirements.

E. No volatile liquids shall be used for cleaning agents or as fuels for motorized equipment or tools within a building except with the express approval of the Construction Manager and in accordance with local codes. On-site bulk storage of volatile liquids shall be outside the buildings at locations directed by the Owner, who shall determine the extent of volatile liquid allowed within the building at any given time.

F. Each Contractor shall comply with the following requirements relating to compressed gas:
   1. Where compressed gas of any type is used for any purpose at the site, it shall be contained in cylinders complying with ICC regulations. Gases of different types shall not be stored together except when in use and when such proximity is required.
   2. Store all gas cylinders shall be in sheds constructed of noncombustible materials. Sheds shall be well ventilated and without electric lights or fixtures and shall be located as far from other buildings as is practicable. All gas cylinders not in actual use, or in proposed immediate use, shall be removed from the building under construction or reconstruction. Empty gas cylinders shall be removed prior to bringing in a replacement cylinder. Cylinders shall at all times be supported and braced in an upright position. When not in use, the protective cap shall be screwed over the valve.
   3. All persons required to handle gas cylinders or to act as temporary firemen (Fire Watchers) shall be able to read, write and understand the English language; they shall also be required by the Contractor to read Part 3 of Pamphlet P-1 “Safe Handling of Compressed Gases” published by the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
   4. Where local ordinances are in effect regarding gas cylinders, (their use, appurtenances and handling), such ordinances shall supplement the requirements of this paragraph. All personnel engaged in fire watch shall be certified by the Local Fire Department having jurisdiction.
   5. LP-Gas Heating will not be permitted in enclosed areas below grade.
   6. Any cylinder not having the proper ICC markings or reinspecting marking, or any cylinder with a leak shall be isolated immediately away from any building and the supplier shall be immediately notified; such other precautions as may be required to prevent damage or injury shall also be taken by the Contractor.

G. Each Contractor shall comply with the following requirements relating to welding and cutting:
   1. During welding or cutting operations, a contractors man shall act as a fire watcher. The fire watcher shall have proper eye protection and suitable fire fighting equipment including fire extinguisher (bearing current inspection Certificate), protective gloves and any other equipment deemed necessary.
   2. Welding or cutting shall not be done near flammable liquid, vapors or tanks containing such material.
   3. Where cutting or welding is done above or adjacent to (within two feet) combustible material or persons, a shield of incombustible material shall be installed to protect against fire or injury to sparks or hot metal.
   4. Tanks supplying gases for welding or cutting are to be placed in an upright position securely fastened, and close as practical to the operation. Tanks, actives or spares, shall be protected from excess heat and shall not be placed in stairways, hallways or exits. When not in use, protective valve cap shall be screwed on the cylinder.
   5. Adequate fire extinguishing equipment shall be maintained at all welding or cutting operations.
   6. The Contractor shall secure all required inspections.
   7. All equipment, hoses, gauges, pressure reducing valves, torches, etc., shall be maintained in good working order and all defective equipment shall immediately be removed from the job.
   8. No person shall be permitted to do any welding or cutting until his name, address and current license number have been submitted in writing to the Construction Manager.
   9. Contractors for work outside the building shall commence operations promptly on award of Contract, and shall be responsible for same being kept clear of materials and debris in connection with their own work and that of other Contractors. If a Contractor for outside work allows other

contractors to deposit material and debris over its lines, the Contractor shall be responsible for all delay and extra cost occasioned thereby.

10. Each Contractor shall provide Fire Extinguishers as follows: Provide type "A" fire extinguishers for temporary offices and similar spaces where there is minimal danger of electrical fires or grease-oil-flammable liquid fires. In other locations provide either type "ABC" dry chemical extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.
11. All required exits, fire alarm, security, automatic temperature control, PA, sprinkler and similar systems shall be maintained and operable throughout the entire construction contract.
    a. Contractor(s) will be back-charged for all fines imposed for false alarms or service calls.
12. Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations. Portable fire extinguishers shall be provided by the Construction Contractor and made conveniently available throughout the construction site. Contractor(s) shall notify their employees of the location of the nearest fire alarm box at all locations where work is in progress.

3.8 DISCONTINUE, CHANGES AND REMOVAL

A. All Contractors shall:
   1. Discontinue all temporary services required by the Contract when so directed by the Owner or the Architect.
   2. The discontinuance of any such temporary service prior to the completion of the work shall not render the Owner liable for any additional cost entailed thereby and each Contractor shall thereafter furnish, at no additional cost to the Owner, any and all temporary service required by such Contractors work.
   3. Remove and relocate such temporary facilities as directed by the Construction Manager or the Architect without additional cost to the Owner, and shall restore the site and the work to a condition satisfactory to the Owner.

3.9 VENTILATION AND HUMIDITY CONTROL FOR CONSTRUCTION

A. Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required. Obtain all required materials to perform related installation on time and per Schedule.

B. Each Contractor shall be responsible for their own temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity.

C. Ventilate enclosed area to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.

D. Provide equipment as necessary for air and fresh exchange for the work area per OSHA standards.

E. Remove temporary ventilation equipment prior to the completion of construction.

F. Each Contractor will provide negative air machines of sufficient size / qty for square footage of work areas to exhaust any dust / fumes through flexible duct hose to exterior to eliminate any odors/smoke etc. During second shift work, there can be no odors in school the following day.

G. In Boiler Rooms, Mechanical Contractor Contract #3, will provide negative air machines of sufficient size / qty for square footage of work areas to exhaust any dust / fumes through flexible duct hose to exterior to eliminate any odors/smoke etc. During second shift work, there can be no odors in school the following day.

H. Any contractor whom allows water infiltration into the building is responsible for cleanup and commercial dehumidifiers of sufficient size and quantity to prevent mold growth. Failure to immediately address will result in owner hiring others and backcharging in order to insure safe school environment

3.10 ENVIRONMENTAL PROTECTION:

A. Refer to Section 01 5719.

3.11 OPERATION, TERMINATION, AND REMOVAL

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 in 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.

END OF SECTION

SECTION 01 5050
PIPE SCAFFOLDING AND SIDEWALK BRIDGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. New Safety Fence and Sidewalk Bridges: The Contractor shall furnish, install, maintain and pay for new safety fences and/or sidewalk bridges. Removal and replacement shall be coordinated so that new fences and bridges are installed the same day the old ones are removed.
   1. Maintain the safety fences and sidewalk bridges until the all work is complete.

B. Pipe Scaffolding: Contractor shall install and maintain pipe scaffolding where required for work as specified until all work and punch list work is complete and approved by the Architect and Construction Manager.
   1. Scaffolding may be installed and removed in phases as the work progresses, at the Contractor's option and approved by the Construction Manager.

C. Install and maintain warning signs, and snow fence and saw horse barricades to alert persons on or about the site, and direct them away from the work areas. Comply with Section 01 3553 - Site Safety and Security Procedures.
   1. Maintain safe egress to and from the building at all times. Do not block any entrances.
   2. Maintain the safety fence, sidewalk bridges and scaffold until all work is complete.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 3553 - Site Safety and Security Procedures.

B. Section 01 5000 - Temporary Facilities and Controls.

C. Section 04 2000 - Unit Masonry.

D. Section 006 1000 - Rough Carpentry.

1.4 QUALITY ASSURANCE

A. Obtain all components of pipe scaffolding and sidewalk bridging from a single source supplier or manufacturer.
   1. Install the scaffolding and sidewalk bridges using personnel thoroughly skilled and competent in the work.
   2. Perform the work causing as little inconvenience to the public and building occupants as possible. Refer to Section 01 1000 - Summary of Contracts .
   3. Furnish and install all scaffold, including supports, fastenings, connections, and details that are designed, sealed and signed by a New York State licensed Professional Engineer, utilizing a minimum safety factor of not less than four times the maximum weight intended to be placed thereon when in use.
   4. Post signage on the scaffold, to indicate the safe permissible scaffold design load. Do not load the scaffold or sidewalk bridges in excess of the safe design loads.

1.5 SUBMITTALS

A. Manufacturer's technical product data, specifications, and installation instructions for all components of pipe scaffolding and sidewalk bridges.
   1. Shop drawings showing the locations, dimensions, and details for all components and assemblies of the pipe scaffolding and sidewalk bridges, signed, sealed and stamped by a professional engineer licensed in New York State.

2. Evidence that all wood products used (for example planking) are fire retardant where required by code.

1.6 PROJECT CONDITIONS

A. Bidders must visit the work site to determine the existing conditions and take whatever measurements are needed before submitting bids.

PART 2 - PRODUCTS

2.1 MATERIALS FOR PIPE SCAFFOLDING

A. Pipe scaffolding shall be constructed of tubular metal sections, or other non-combustible material, to meet at a minimum the NYS Building Code, and OSHA requirements.
   1. Pipe Scaffolding shall be Heavy Duty.
   2. Lumber used in the erection of the scaffold or sidewalk bridges shall be at least equal in strength and quality to construction grade Douglas fir, and treated with a recognized fire retardant.
   3. Fasteners to secure lumber and timber shall be galvanized nails or bolts of a suitable size to produce a secure joint capable of withstanding the design load.
   4. Mud sills shall be 2 X 10 inch wood planks.

2.2 MATERIAL FOR SIDEWALK BRIDGES

A. Posts - 3-1/2 inch standard pipe spaced 8 feet on center longitudinally.
   1. Beams - 6 I to 10 I structural steel beams, dependent upon sidewalk width and live load.
   2. Joists - 3 I to 6 I structural steel beams, or 3 x 6 inch to 4 x 8 inch timber, dependent upon joist spacing and live load.
   3. Decking - nominal 2 inch thick planking, dependant upon joist framing and live load.
   4. Top platform perimeter fence – 1/2 inch hardware cloth mesh, installed 4 feet high above the top platform, fastened to catch and prevent material or debris from sliding down the roof and off the scaffold.
   5. Bracing - 1-1/2 inch standard pipe for girts and railings, 3/4 standard pipe for cross bracing.
   6. Mud Sills - 2 x 10 inch wood planks.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE SCAFFOLDING

A. Install and maintain pipe scaffolding waist height at all main roof gutter eaves; to access construction areas.
   1. Except as otherwise indicated, install planks to overhang their end supports at least 6 inches, and fasten them securely to prevent dislodgement. Do not allow planks to overhang in excess of 18 inches. Lay planks tight together, to form a full scaffold width platform.
   2. Install guardrails and toe boards on the sides and ends of every scaffold platform.
   3. Install wire screening along the outside edge of scaffold to prevent debris and material from falling off.
   4. Install cross bracing supports in all scaffold bays.
   5. Install at one set of scaffold access stairs from grade to each work level, at each section of the building where/when work is underway. Provide a 12 foot high plywood fence, and a hinged gate with a padlock to secure the bottom of each set of stairs. Distribute twelve padlock keys to representatives of the Owner, Architect and other authorized personnel.
   6. Install plywood to cover the bottom 8 feet of scaffold, where public access is possible – for example, adjoining entrance doors and where the scaffold is not' surrounded by the safety fence.

3.2 INSTALLATION OF SIDEWALK BRIDGES

A. Maintain sidewalk bridges to maintain public egress pathways to and from the building.

1. Install the bridges such that they do not block lighting fixtures, fuel oil intakes, exhaust vents and doors.
2. Plank over the sidewalk bridges the full width of the egress path.
3. Brace the sidewalk bridges longitudinally and horizontally in each bay. Make connections with clamps.

3.3 MAINTENANCE

A. Maintain work areas free of waste materials, debris and rubbish. Maintain the site in a clean and orderly condition.
   1. Immediately provide temporary measures to safe guard any scaffold or sidewalk bridge, which is damaged or otherwise adversely effected for any reason, and persons on or about the site, and repair or replace the effected portions of scaffolding and/or bridging within 48 hours, but before any further use.

3.4 OWNER & ARCHITECT ACCESS

A. Permit representatives of the Owner, Architect, and Construction Manager access to the scaffold at all times.

3.5 DISMANTLING AND REMOVAL

A. Carefully dismantle and remove scaffolding, fencing and sidewalk bridges only after all work, and all Punch List work is complete and approved in writing by the Architect and Construction Manager.
   1. Remove scaffold material from the site the same day it is disassembled. Do not store material at the site except with the specific prior permission of the Owner.
   2. Post signs, erect barricades and station flag man around the site to prevent accidents and to insure the protection of the public.
   3. Clean and repair damage caused by the installation and removal of the scaffolding and sidewalk bridges. Restore existing facilities used or affected by construction activities to their original condition.

END OF SECTION

SECTION 01 5213
FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Temporary field offices for use of each Contractor.

B. Maintenance and removal.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Use of premises.

B. Section 01 5000 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

C. Section 01 5500: Parking and access to field offices.

1.4 USE OF EXISTING FACILITIES

A. Existing facilities shall not be used for field offices.

1.5 USE OF PERMANENT FACILITIES

A. Permanent facilities shall not be used for field offices.

PART 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION

A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove at completion of Work or when directed by the Construction Manager.

C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy requirements.

D. Exterior Materials: Weather resistant, finished in one color.

E. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.

F. Lighting for Offices: 50 fc (538 lx) at desk top height, exterior lighting at entrance doors.

G. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.3 ENVIRONMENTAL CONTROL

A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.4 CONTRACTOR OFFICE AND FACILITIES

A. Each Contractor is responsible for all cost for their field offices including utilities.

B. Size: For Each Contractor's needs and to provide space for project meetings.

C. Telephone: As specified in Section 01 5000.

D. Other Furnishings: Each Contractor's option.

E. Equipment: Six adjustable band protective helmets for visitors, one 10 inch (250 mm) outdoor weather thermometer .

PART 3 EXECUTION

3.1 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.2 INSTALLATION

A. Install Trailer office spaces ready for occupancy 15 days after date fixed in Notice of Award.

B. Parking: At each trailer provide Two hard surfaced parking spaces for use by contractors connected to offices by hard surfaced walk.

3.3 MAINTENANCE AND CLEANING

A. Weekly janitorial services, including supplies for contractor's offices; periodic cleaning and maintenance for offices shall be the responsibility of each contractor for their own trailer.

B. Maintain approach walks free of mud, water, and snow.

3.4 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Each contractor shall restore all disturbed areas to originally intended conditions.

END OF SECTION

SECTION 01 5500
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Access roads.

B. Temporary roads and/or paving.

C. Existing pavements and parking areas.

D. Permanent pavements and parking facilities.

E. Construction parking controls.

F. Flag persons.

G. Haul routes.

H. Traffic signs and signals.

I. Maintenance.

J. Removal, repair.

K. Mud from site vehicles.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: For access to site, work sequence, and occupancy.

B. Section 01 5000 - Temporary Facilities and Controls.

C. Section 01 5813 - Temporary Project Signage: Post Mounted and Wall Mounted Traffic Control and Informational Signs.

D. Section 01 5719 - Environmental Protection During Construction.

PART 2 PRODUCTS

2.1 RESPONSIBILITY

A. General Construction, Contract #1 is responsibility for the requirements of this section for all contracts.

2.2 MATERIALS

A. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and topping.

2.3 SIGNS, SIGNALS, AND DEVICES

A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 5813 - Temporary Project Signage.

B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

C. Flag Person Equipment: As required by Construction Manager or local jurisdictions.

PART 3 EXECUTION

3.1 PREPARATION

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.2 ACCESS ROADS

A. Use of designated existing on-site streets and driveways for construction traffic is permitted as approved Construction Manager or local jurisdictions.

B. Tracked vehicles not allowed on paved areas.

C. General Contractor Contract #1shall construct and maintain temporary areas adequate to support loads and to withstand exposure to traffic during construction period.

1. Includes access for delivery through staging area to building work areas, and to equipment and storage areas and sheds. Maintenance of existing staging area to prevent / repair any ruts by grading with heavy equipment and placement of import ¾" stone for smooth, stable surface.
2. Provide dust-control treatment that is nonpolluting and contracting. Reapply treatment as required to minimize dust.
3. Temporary areas are installed and/or maintained by for access to all required areas of the sites.
4. Contractors will be permitted to utilize existing facility roads, as designated (as segregated by the Construction Manager and shown on drawings.
5. Road Cleaning: Maintain roads and walkways in an acceptably clean condition. This includes the removal of debris daily, if required, and/or a minimum of once a week due to all project traffic. Road cleaning equipment to be wet/vacuum type. The General Work Contractor (Contract #1) will clean roads for debris from building-related activities.
6. Snow Plowing: The General Contractor Contract #1 shall provide snow plowing of temporary road, parking areas, access route, and a 5' walkway to office trailer. Provide snow removal and salting of walkways to Construction Manager's office trailer. The school district will provide snow plowing of established routes.

D. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

E. Staging Areas:

1. Staging areas as indicated on drawings will be provided by the Contractor and shall consist of the following: (Minimum Thickness: 4" or as required by soil conditions).
   a. Typed 4 Crushed stone base and conform to the requirements of Section 304 of NYS DOT Specifications. No recycled material of any kind is allowed on the project.
   b. Gradation shall conform to the following:

Sieve Size	Percent Passing by Weight
3 inch:	100
2 inch:	90-100
1/4 inch	30-65
No. 40	5-40
No. 200	0-10

F. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.

G. Location as indicated.

H. Provide unimpeded access for emergency vehicles. Maintain 20 foot (6 m) width driveways with turning space between and around combustible materials.

I. Provide and maintain access to fire hydrants free of obstructions.

3.3 PARKING

A. Temporary parking by construction personnel shall be allowed only in areas so designated by the Construction Manager. Owner does not have space for construction parking in existing parking lots or roadways and will subsequently have vehicles in violation of parking prohibitions towed from site and back-charged with all fees to the contractor.

B. Use of new parking facilities by construction personnel is not permitted unless approved by the Construction Manager.

C. Locate as indicated.

3.4 PERMANENT PAVEMENTS AND PARKING FACILITIES

A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.

B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.5 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Brewster Central School District's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

D. Traffic Regulations:

1. Access through Owner's entrances shall be limited.
2. Utilize only entrances/temporary roads as designated.
3. Maintain all District traffic regulations.
4. Construction parking will not be allowed adjacent to District buildings, additions or monuments.

3.6 FLAG PERSONS

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.7 HAUL ROUTES

A. Confine construction traffic to designated haul routes.

B. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.8 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Refer to 01 5813 - Temporary Project Signage for additional requirements.

C. Relocate as work progresses, to maintain effective traffic control.

3.9 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.10 REMOVAL, REPAIR

A. Remove temporary roads when permanent paving is usable.

B. Remove underground work and compacted materials to a depth of 2 feet (600 mm); fill and grade site as specified.

C. Repair existing facilities damaged by use, to original condition.

D. Repair damage caused by installation.

3.11 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets. See drawings for details.

END OF SECTION

SECTION 01 5510
TRAFFIC AND PEDESTRIAN ACCESS & CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Each Contractor shall maintain traffic for the duration of the contract and protect the traveling public and pedestrians from all damage to persons and property within the limits of and for the duration of the contract; all in accordance with the plans and specifications.

B. It is specifically noted that while school is in session, there are student playing at recess, walking to outdoor gym classes, etc. Contractor's trucks must be walked from the project site to the main traffic loop and vice versa, with a separate monitoring individual to insure children's safety. See 01 1000 - Summary for delivery black out times.

C. Refer to Site Safety Plan for additional information.

1.3 METHOD OF MAINTAINING AND PROTECTING TRAF0FIC

A. Each Contractor shall maintain and protect traffic by so conducting his construction operations that the traveling public and pedestrian safety is subjected to a minimum of hazard and delay. In order to adequately maintain and protect traffic, contractor shall perform the following additional minimum requirements as directed by Owner's Representative:

1. Keep the surface of the traveled way free from mounds, depressions, and obstructions of any type which could present hazards or annoyance to traffic.
2. Keep the surface of all pavements used by the public free and clean of all dirt, debris, stone, timber or other obstructions to provide safe traveled ways.
3. Control dust and keep the traveled way free from materials spilled from hauling and construction equipment.
4. Provide all cones, barricades, signs and warning devices as may be required and/or as ordered by the Construction Manager to safely carry out the foregoing. All such signs and devices shall be fabricated and placed in accordance with the latest "FEDERAL MANUAL ON UNIFORM CONTROL DEVICES". USE OF OPEN FLARES IS PROHIBITED.
5. Prepare and submit for approval sketch/drawing showing proposed location and type of signs, barricades and devices as required in above.
6. Contractor shall cover with steel plates all open trenches at the close of each work day. Such plates to abut each other and be wedged at each end of trench to prevent plates from sliding open.
7. Contractor to post temporary construction signs, including construction traffic signs, safety signs, security signs, and no trespassing signs as required.

1.4 INGRESS AND EGRESS

A. Contractor shall provide and maintain at all times safe and adequate ingress and egress to and from site at existing or at new access points consistent with work, unless otherwise authorized by the Construction Manager.

1.5 CONTRACTOR'S ATTENTION IS DIRECTED TO

A. If, upon notification by Construction Manager, contractor fails to correct any unsatisfactory condition within 24 hours of being so directed, Construction Manager will immediately proceed with adequate forces to properly maintain the project and the entire cost of such maintenance shall be deducted (back charged) from any moneys due the contractor.

1.6 PAYMENT

A. The lump sum bid price for this item shall include the cost of furnishing all labor, material and equipment including the cost of any and all incidental required by job conditions as ordered by Construction Manager.

B. Withholding of Payment

1. No payment will be made under Maintenance and Protection of Traffic for each calendar day during which there are substantial deficiencies in compliance with the specification requirements of any subsection of this section, as determined by the Owner's Representative.
2. The amount of calendar day nonpayment will be determined by dividing the lump sum amount bid for Maintenance and Protection of Traffic by the number of calendar days between the date of the contractor commences work and the date of completion, as designated in the proposal, without regard to any extension of time.
3. In addition, for each calendar day or part thereof of any unsatisfactory work violating the required provisions of any subsection under Maintenance and Protection of Traffic, liquidated damages will be assessed at $100.00.
4. If Contractor fails to maintain and protect traffic adequately and safely for a period of 24 hours, the Construction Manager shall correct the adverse conditions by any means he deems appropriate, and shall deduct the cost of the corrective work from any Monies due the Contractor. The cost of this work shall be in addition to the liquidated damages and nonpayment for Maintenance and Protection of Traffic listed above.
5. However, where major non conformance with the requirements of this specification is noted by the Construction Manager and prompt contractor compliance is deemed not to be obtainable, all contract work may be stopped by direct order of the Owner's Representative regardless of whether corrections are made by the Construction Manager as stated in the paragraph above.

END OF SECTION

SECTION 01 5527
TRAFFIC MAINTENANCE AND PROTECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. The Work of this Section shall be required in all areas within the project limits and consists of maintaining traffic and protecting the public from damage to persons and property that will be open to public vehicular traffic for the duration of this contract.

B. Maintain traffic over a reasonably smooth traveled way marked by signs, delineators, guiding devices and other acceptable methods in conformance with the New York State Manual of Uniform Traffic Control Devices (MUTCD).

1.3 RESPONSIBILITY

A. General Construction, Contract #1 is responsibility for the requirements of this section for all contracts.

B. Assume responsibility for conducting operations in a manner to insure the safety and convenience of all travelers and adjoining property owners within the limits of and for the duration of the contract.

PART 2 PRODUCTS

2.1 MATERIALS

A. Comply with the requirements of DOT Section 700 Materials as they apply to the various materials required for the Work of this Section.

B. Provide sign panels of aluminum, galvanized steel or plywood with faces of reflective sheet material and non-reflective black characters conforming to DOT Section 730-13.

C. Provide delineators, barricades and lighting for construction barricades in accordance with the requirements of MUTCD. Where reflective materials are required, conform to DOT Section 730-05.02 except where glass or plastic buttons are used as delineators. Barricades, cones and drums may use reflective materials conforming to DOT Section 730-05.01

D. Provide pavement delineation of reflective paint or reflective pressure sensitive pavement marking tape. Line segments shall be a minimum of 4 inches wide and 36 inches long applied with the long axis of the segment parallel to the direction of traffic.

PART 3 EXECUTION

3.1 GENERAL

A. Remove construction equipment and materials from roadway during non-working hours or provide protection in such a manner that they will not constitute a traffic hazard.

B. Conduct and schedule the Work in a manner that will minimize the time during which the traveling public will be exposed to hazards.

C. Do not park employees personal vehicles within the work area in a manner that they will constitute a traffic hazard.

D. Provide a traveled way suitable for two lanes of moving traffic. Keep traveled way reasonably smooth and hard at all times.

E. Keep the traveled way of all public highways utilized for hauling materials to or from this project free of foreign objects that may fall or drop from transporting vehicles.

F. Correct dusty conditions resulting from the Work by the use of calcium chloride and/or water.

G. Distribute water uniformly by the use of suitable spray heads or spray bar. The Construction Manager will be the sole judge of the need for the application of water for dust control. Apply water at the intervals and locations ordered by the Construction Manager.

H. Whenever it becomes necessary to maintain traffic on one lane, provide adequate traffic controls on the Section of Roadway on which vehicle traffic is maintained. Provide competent flag persons or traffic signals at the location which will in the judgment of the Construction Manager adequately and continuously control one lane traffic.

I. Provide a sufficient number of competent flag persons in areas where construction operations are in potential conflict with public vehicular traffic. Flag person shall wear orange hats or caps and vests in conformance with MUTCD.

J. Maintain safe and adequate ingress and egress to and from intersecting highways, residences and commercial establishments.

K. The General Construction, Contract #1 is not responsible for removal of snow and ice from pavements or traveled ways open to public vehicular traffic.

L. Maintain existing and new drainage structures, culverts and ditches to adequately drain the traveled way.

M. Provide, maintain, move and remove delineation and guiding devices to properly delineate a safe and reasonable roadway. Delineate areas on which it is unsafe to travel.

N. Delineate dropoffs less than 6 inches by providing approved delineators at intervals of not more than 200 feet. Where the drop off is between 6 inches and 18 inches, the spacing between delineators shall not be more than 100 feet. Where the drop off is greater than 18 inches, a continuous delineation consisting of 2 inch or wider brightly colored flexible tape shall be used in addition to individual delineators provided they are properly painted and reflectorized in accordance with MUTCD.

1. Maintain existing highway signs, markers, delineators and their supports. Where necessary, relocate existing signs in conformance with MUTCD. Replace signs lost or damaged as a result of contract operations.

O. All excavations shall be backfilled in the same day. No trenches shall be left open overnight.

1. When steel plating over excavations is required, the plates shall be secured with sufficient spikes and blended into the existing pavement with either keyways or asphalt pavement.

3.2 CONSTRUCTION SIGNS

A. Refer to Section 01 5813 - Temporary Project Signage for additional requirements

B. Provide, maintain, move and remove reflectorized construction signs in accordance with the requirements of MUTCD.

C. Paint supports and backs of sign panels with two coats of white paint.

1. Mount construction signs a minimum of 5 feet above the surface of the traveled way.

3.3 CONSTRUCTION BARRICADES

A. Provide, maintain, move and remove lighted construction barricades in accordance with the requirements of MUTCD.

B. Provide flashing barricade lights of Type A, low intensity conforming to the requirements of Section 294.3 of MUTCD.

C. Hours of operation for barricade lights shall be from dusk to dawn.

3.4 PAVEMENT DELINEATION

A. Provide pavement delineation in accordance with MUTCD on any course of asphalt concrete upon which traffic will be maintained.

B. Apply pavement delineation before the end of the working day.

3.5 OPENING ROADWAY TO TRAFFIC PRIOR TO CONTRACT ACCEPTANCE

A. Maintain and protect traffic on any portion of pavement or structure ordered in writing by the Owner's Representative or as shown on the drawings to be opened to traffic prior to contract acceptance.

3.6 REMOVAL OF TRAFFIC CONTROL DEVICES

A. Promptly remove all delineators, signs, barricades and pavement workings when in the opinion of the Owner's Representative their presence constitutes a hazard or inconvenience to the traveling public.

B. Remove all remaining traffic control devices upon completion of the Work of this contract unless otherwise ordered in writing by the Owner's Representative.

END OF SECTION

SECTION 01 5713
TEMPORARY 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 1 Specification Sections, apply to this Section.

1. SUMMARY
   a. This section includes furnishing, installing, maintaining, and removing temporary erosion and sediment control measures as shown on the contract documents or as ordered by the Engineer throughout the life of the contract to control soil erosion, sediment and water pollution through the use of temporary swales, check dams, bales, sediment traps, and silt fences.
   b. Related Sections include other Division 31 Sections.
2. REFERENCES
   a. Materials installation, maintenance, inspection and removal shall be in accordance with the New York State Standards and Specifications For Erosion and Sediment Control.
   b. This project is subject to the New York State Department of Environmental Conservation Stormwater Pollution Prevention Plan. All terms and conditions of said permits shall be adhered to.
3. SUBMITTALS
   a. Submittals shall be submitted in accordance with the provisions set forth in the General Specifications.
   b. Submittal shall contain source and supplier of material showing its compliance with specifications and associated standards.
   c. Samples of any kind shall be submitted upon Engineer’s request.
   d. The Contractor shall submit schedules for the accomplishment of temporary sediment control work.
   e. A.

PART 2 - PRODUCTS

2.1 GENERAL

A. Products shall be as specified on the contract drawings and as stated in New York State Standards and Specifications For Erosion and Sediment Control.

PART 3 - EXECUTION

INSTALLATION

4.1 In the event of conflict between these specification requirements and pollution control laws, rules or regulations by other federal, state or local government agencies, the more restrictive rules and regulations shall apply.

4.2 Temporary erosion and sediment control measures shall be inspected by the Contractor and maintained during the life of the project, and such maintenance and inspection shall continue until permanent stabilization measures are in place and the temporary control measures are ordered to be removed by the Engineer, and the disturbed area returned to its intended stabilized condition.

4.3 The Engineer has the authority to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary erosion and sediment control measures to minimize damage to adjacent property and to minimize contamination of adjacent watercourses or wetlands.

4.4 The Contractor shall submit schedules for the accomplishment of temporary and permanent erosion and sediment control work to the Engineer for acceptance. All work done under this section shall be included as part of the construction schedule submitted by the Contractor.

4.5 Maintenance shall be performed as directed by the Engineer. All sediment deposits shall be considered unsuitable material and properly disposed of.

4.6 The Contractor shall immediately repair or replace defective or damaged portions of the erosion and sediment control facilities.

4.7 Erosion and sediment control measures shall be installed where necessary and shall remain in place until the area is permanently stabilized or the Engineer directs that it be removed. Upon removal, the Contractor shall remove and dispose of any sediment accumulations and restore the area as directed by the Engineer. The removed facilities and materials shall become the property of the Contractor and be removed from the site.

END OF SECTION

SECTION 01 5719
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

C. Testing indoor air quality before commencement of construction; existing building areas only.

D. Testing indoor air quality after completion of construction.

1.3 RESPONSIBILITY

A. The General Construction Contractor Contract #1 is responsible for providing the work specified in this section and pays all costs for all contracts.

1.4 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Each Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
   3. Establish condition of existing ducts and equipment prior to start of alterations.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.5 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Testing and inspection services.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

C. Division 23 - HVAC, Air Cleaning Devices, Testing, adjusting and Balancing for HVAC.

1.6 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.

B. ASHRAE Std 129 - Measuring Air-Change Effectiveness; 1997 (Reaffirmed 2002).

C. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology); 2016.

D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

E. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air; 1990.

F. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air; 1999.

G. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.7 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.8 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
   1. Identify potential sources of odor and dust.
   2. Identify construction activities likely to produce odor or dust.
   3. Identify areas of project potentially affected, especially occupied areas.
   4. Evaluate potential problems by severity and describe methods of control.
   5. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
   6. Describe cleaning and dust control procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Air Contaminant Test Plan: Identify:
   1. Testing agency qualifications.
   2. Locations and scheduling of air sampling.
   3. Test procedures, in detail.
   4. Test instruments and apparatus.
   5. Sampling methods.

F. Air Contaminant Test Reports: Show:
   1. Location where each sample was taken, and time.
   2. Test values for each air sample; average the values of each set of 3.
   3. HVAC operating conditions.
   4. Certification of test equipment calibration.
   5. Other conditions or discrepancies that might have influenced results.

G. Ventilation Effectiveness Test Reports: Show:
   1. Include preliminary tests of instruments and apparatus and of test spaces.
   2. Calculation of ventilation effectiveness, E.
   3. Location where each sample was taken, and time.
   4. Test values for each air sample.
   5. HVAC operating conditions.
   6. Other information specified in ASHRAE Std 129.
   7. Other conditions or discrepancies that might have influenced results.

1.9 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. Low VOC Materials: See Section 01 6116.

B. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

PART 3 EXECUTION

3.1 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
   1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
   2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
   3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.
   1. If work effects occupied portions of the facility perform work after hours or when building is unoccupied.

D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

E. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
   1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
   2. Exhaust directly to outside.
   3. Seal HVAC air inlets and outlets immediately after duct installation.

F. Do not store construction materials or waste in mechanical or electrical rooms.

G. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
   3. Clean tops of doors and frames.
   4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
   5. Clean return plenums of air handling units.
   6. Remove intake filters last, after cleaning is complete.

H. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

I. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.2 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Do not start flush-out until:
   1. All construction is complete.
   2. HVAC systems have been tested, adjusted, and balanced for proper operation.
   3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.
   4. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.

5. New HVAC filtration media have been installed.

C. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot (4500 cubic meters per square meter) of floor area has been supplied.
   1. Obtain Brewster Central School District's concurrence that construction is complete enough before beginning flush-out.
   2. Maintain interior temperature of at least 60 degrees F (15 degrees C) and interior relative humidity no higher than 60 percent.
   3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
   4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
      a. Begin ventilation at least three hours prior to daily occupancy.
      b. Continue ventilation during all occupied periods.
      c. Provide minimum outside air volume of 0.30 cfm per square foot (0.0015 cu m/s/sq m) or design minimum outside air rate, whichever is greater.

D. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.3 AIR CONTAMINANT TESTING

A. Contractor's Option: Either full continuous flush-out, or satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.

C. Perform air contaminant testing before occupancy.

D. Do not start air contaminant testing until:
   1. All construction is complete, including interior finishes.
   2. HVAC systems have been tested, adjusted, and balanced for proper operation.
   3. New HVAC filtration media have been installed.

E. Indoor Air Samples: Collect from spaces representative of occupied areas:
   1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
   2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet (2300 square meters); take samples from areas having the least ventilation and those having the greatest presumed source strength.
   3. Collect samples from height from 36 inches (915 mm) to 72 inches (1830 mm) above floor.
   4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
   5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
   6. When retesting the same building areas, take samples from at least the same locations as in first test.

F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

G. Analyze air samples and submit report.

H. Air Contaminant Concentration Limits:
   1. Formaldehyde: Not more than 27 parts per billion.
   2. PM10 Particulates: Not more than 50 micrograms per cubic meter.
   3. Total Volatile Organic Compounds (TVOCs): Not more than 500 micrograms per cubic meter.

4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: Allowable concentrations listed in Table 4-1.
5. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.

I. Air Contaminant Concentration Test Methods:
1. Formaldehyde: ASTM D5197, EPA 625/R-96/010b Method TO-11A, or EPA 600/4-90/010 Method IP-6.
2. Particulates: EPA 600/4-90/010 Method IP-10.
3. Total Volatile Organic Compounds (TVOC): EPA 625/R-96/010b Method TO-1, TO-15, or TO-17; or EPA 600/4-90/010 Method IP-1.
4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: ASTM D5197, or EPA 625/R-96/010b Method TO-1, TO-15, or TO-17.
5. Carbon Monoxide: EPA 600/4-90/010 Method IP-3, plus measure outdoor air; measure in ppm; report both indoor and outdoor measurements.

END OF SECTION

SECTION 01 5813
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

C. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts.

B. Section 01 5000 - Temporary Facilities and Controls.

1.4 REFERENCE STANDARDS

A. FHWA (SHS) - Standard Highway Signs and Markings; 2004, with Supplement (2012).

1.5 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr (80 km/hr) wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.1 RESPONSIBILITY

A. General Construction, Contract #1 is responsibility for the requirements of this section for all contracts.

2.2 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch (19 mm) thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.

E. Lettering: Exterior quality paint, colors as selected.

2.3 PROJECT IDENTIFICATION SIGN

A. Project Identification Sign shall be the responsibility of General Contractor Contract #1.

B. One painted sign, 48 sq ft (4.5 sq m) area, bottom 6 feet (2 m) above ground.

C. Content:

1. Project number, title, logo and name of Brewster Central School District as indicated on Contract Documents.
2. Names and titles of authorities.
3. Names and titles of Owner's Representative, Architect, or Construction Manager and Consultants.

4. Name of Prime Contractors .

D. Graphic Design, Colors, Style of Lettering: Designated by Architect .

2.4 PROJECT INFORMATIONAL SIGNS

A. Each Contractor shall provide identification signage at field office and storage trailers with contractor's name and telephone number.

B. General Contractor Contract #1 shall provide directional signs to direct traffic into and within site . Relocate as Work progress requires.

2.5 TEMPORARY SITE SAFETY AND DIRECTIONAL SIGNS:

A. Prepare temporary signs to provide directional information to construction personnel and visitors.

B. Construct signs of exterior type Grade AC plywood ½" thick. Support on posts or framing of preservative-treated wood or steel, or attach to fencing; do not attach signs to buildings or permanent construction.

C. Paint sign panel and applied graphics with exterior grade alkyd gloss enamel over exterior primer. Engage an experienced sign painter or fabricator to apply graphics.

D. Include relocating temporary site safety and directional signs as many times as required or directed.

E. Metal DOT / MUTCO compliant signage is acceptable where applicable.

F. The General Contractor Contract #1 shall furnish and install construction signage as required at each project site.

1. For construction traffic control/flow at entrances/exits, as designated by the Owner (8 required)
2. To direct visitors (4 required)
3. For construction parking (4 required)
4. To direct deliveries (4 required)
5. Emergency egress only - Construction area (8 required)
6. Per OSHA standards as necessary
7. For "No Smoking" safe work site at multiple locations (6 required)

PART 3 EXECUTION

3.1 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

C. Install sign surface plumb and level, with butt joints. Anchor securely.

D. Paint exposed surfaces of sign, supports, and framing.

3.2 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.3 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of the project and restore the area.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Maintenance materials, extra materials.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts.

B. Section 01 2500 - Substitution Procedures: Substitutions made after the Bidding/Negotiation Phase.

C. Section 01 4000 - Quality Requirements: Product quality monitoring.

D. Section 004401 - Contractor’s Qualification Statement.

E. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

F. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.4 REFERENCE STANDARDS

A. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services; 2017.

B. NEMA MG 1 - Motors and Generators; 2017.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.5 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.

B. 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.

C. 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.

D. 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.

E. Substitutions: Changes in products, materials, equipment, and methods of construction from those required or specified by the Contract Documents and proposed by Contractor.

F. 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 which shall be submitted as substitutions.

G. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

1.6 SUBMITTALS

A. Refer to Section 01 3000 - Administrative Requirements for additional requirements

B. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 10 days after date of Notice of Award.
   2. For products specified only by reference standards, list applicable reference standards.

C. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.7 ASBESTOS

A. Asbestos: All products, materials, etc., used in conjunction with this Project shall be Asbestos-Free.
   1. Contractor shall provide a certified letter to the Owner stating that no asbestos containing material has been used in this project. Refer to Section 01 7800 - Closeout Submittals.

B. HVAC and sub contractors must provide test results upon completion from a New York State accredited testing lab certifying that all pipe insulation and joints on this project contain no asbestos.
   1. This certification shall be based on a sampling of 10% of all linear feet of pipe insulation, (unless manufacturer's certificate is submitted).

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Brewster Central School District, or otherwise indicated as to remain the property of the Brewster Central School District, become the property of the Contractor(s); remove from site.

2.2 NEW PRODUCTS

A. Provide new products for all unless otherwise specifically required or permitted by the Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Made using or containing CFC's or HCFC's.
   3. Made of wood from newly cut old growth timber.
   4. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste. See Section 01 7419
   6. Are Cradle-to-Cradle Certified.
   7. Have a published Environmental Product Declaration (EPD).
   8. Have a published Health Product Declaration (HPD).

2.3 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named. Submit on form attached.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Administrative Requirements". All products, other than "Basis of Design", shall be submitted as a substitution. Show compliance with requirements. Submit on form attached.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
   1. Deliver to Construction Manager; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 SUBSTITUTION SUBMITTAL PROCEDURE AFTER BIDDING PHASE

A. Refer to Section 01 2500 - Substitution Procedures.

3.2 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.3 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 6116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. VOC restrictions for product categories listed below under "DEFINITIONS."

D. All products of each category that are installed in the project must comply; Brewster Central School District's project goals do not allow for partial compliance.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

C. Section 07 9200 - Joint Sealants: Emissions-compliant sealants.

1.4 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Flooring.
   4. Products making up wall and ceiling assemblies.
   5. Thermal and acoustical insulation.
   6. Free-standing furniture.
   7. Exterior applied products (for Healthcare and Schools projects only).

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Wet-applied roofing and waterproofing.
   4. Other products when specifically stated in the specifications.
   5. Adhesives, sealants, and sealer coatings.
   6. Carpet.
   7. Resilient floor coverings.
   8. Wood flooring.
   9. Gypsum board.
   10. Acoustical ceilings and panels.
   11. Other products when specifically stated in the specifications.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.5 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

C. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.

D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

E. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.

G. UL (GGG) - GREENGUARD Gold Certified Products; UL Environment; current listings at http://http://productguide.ulenvironment.com/QuickSearch.aspx.

H. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.

I. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

K. SCS (CPD) - SCS Certified Products; Current Edition.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.

C. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.7 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).
   4. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

C. All VOC-Restricted Products: Provide products having VOC content of types and volume not greater than those specified in State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current GREENGUARD Children & Schools certification; www.greenguard.org.
      b. Current Carpet and Rug Institute Green Label Plus certification; www.carpet-rug.org.
      c. Current SCS Floorscore certification; www.scscertified.com.
      d. Current SCS Indoor Advantage Gold certification; www.scscertified.com.
      e. Product listing in the CHPS Low-Emitting Materials Product List at www.chps.net/manual/lem_table.htm.
      f. Current certification by any other agencies acceptable to CHPS.
      g. Report of laboratory testing performed in accordance with CHPS requirements for getting a product listed in the Low-Emitting Materials Product List; report must include laboratory's statement that the product meets the specified criteria.
   2. Product data submittals showing VOC content are NOT acceptable forms of evidence.

D. Adhesives and Joint Sealants: Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

E. Aerosol Adhesives: Provide only products having volatile organic compound (VOC) content not greater than required by GreenSeal GS-36.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current GreenSeal Certification.

F. Paints and Coatings: Provide products having VOC content as specified in Section 09 9000.

G. Carpet and Adhesive: Provide products having VOC content not greater than that required for CRI Green Label Plus certification.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current Green Label Plus Certification.

b. Report of laboratory testing performed in accordance with requirements.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Brewster Central School District reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Brewster Central School District.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 6190
MATRIX OF BUILDING SYSTEM RESPONSIBILITY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. This section describes the relationship and responsibilities of the Prime Contractors, suppliers, vendors, subcontractors and Owner.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

B. Section 01 2000 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.

C. Section 01 2100 - Allowances: Cash and contingency allowances.

D. Section 01 2300 - Alternates: Descriptions of items, administrative requirements.

E. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

F. Section 01 7900 - Demonstration and Training: Detailed requirements.

G. Section 01 9113 - General Commissioning Requirements.

1.4 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 2100 - Allowances, for cash allowances affecting this section.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.1 RESPONSIBILITY

A. It is the Contactors responsibility to coordinate and obtain from the Owner all information neccessary to complete the work.

3.2 ATTACHMENTS

A. Matrix is attached to this section.

END OF SECTION

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
DATA			
Rough-in: Conduit drops in walls, wired to outlet, conduit (unfinished area), conduit sleeve, junction box (wall and/or ceiling type), outlet box, floor box, poke-thru, cover plate with female bulk head, supports.	EC	EC	
In wall combo boxes, cover plate, bulkheads (Jacks) for Data/Tele and AV.	EC	EC	
Data Cat 6 Cable Support - J-Hooks, fire rated zip ties and ladders in data closet.	EC	EC	
			All Addresses will be furnished by BCSD
Data Cat 6 Cable - From Data Outlet & WAP to Patch Panel. Tag both ends of cable, type written address nomenclature at outlet and patch panel, Test cable as per Spec.	EC	EC	
Data cable color selection.	N/A	N/A	No BCSD color standard
New Data rack/closets: new racks, ladders, patch panels and all patch cords. EC shall furnish the following: Forty (40) BLACK color and Forty (40) GRAY color, 1'-0" lengths.	EC	EC	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
DATA (Continued)			
Fiber Cable - From IDF to MDF, including connectors, connection (termination), labelling and testing , OM3 (12 Strand 10 Gigabyte) 50um Fiber Cable - Specific cable type description shall be provided by BCSD)	EC	EC	
Device Address to be furnished by BCSD to Electrical Contractor - EC to provide labels)	BCSD	EC	
Wireless Access Point Device (WAP) and configuration.	BCSD	EC	
WAP installed in Cafetorium & Music Room; wiring shall be in Conduit.	BCSD	EC	
WAP Conduit and Wire	EC	EC	
Switches, servers, Relays UPS onto racks including installing patch cords from patch panel to switches. Patch Cords furnished by EC as indicated above.	BCSD	BCSD	
Provide PC's, Lap Tops, I-Pads, Chrome Carts	BCSD	BCSD	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
DATA (Continued)			
Interface with District Network including and not limited to Programming, Integration, Commissioning of Hardware and Software. Include all licences.	BCSD	BCDS	
Patch and Paint at Existing area	EC	EC	
Patch and Paint at New area	GC	GC	
Plywood mounting boards for patch panels, etc..	EC	EC	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Telephone			
Rough-in: Conduit drops in walls, wiremold, conduit, conduit sleeve, junction box, outlet box, floor box, poke-thru, cover plate with female bulk head, mini PBX, supports.	EC	EC	EC to Coordinate with Verizon for Mini PBX.
Telephone Cat 6 Cable Support - J-Hooks, fire rated zip ties.	EC	EC	
Telephone Cat 6 Cable - From Telephone Outlet to Patch Panel. Tag both ends of cable, type written address nomenclature at outlet and patch panel, include patch panels, patch cords (Patch cord quantity listed under Data Section). Test cable as per Spec.	EC	EC	
Telephone cable color selection.	BCSD	N/A	EC to refer to Color Chart by BCSD for all Cable Color
Telephone Head-end equipment.	BCSD / Verizon	BCSD / Verizon	Coordinated by CM/BCSD
Telephone Hand Set.	BCSD	BCSD	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Telephone (Continued)			
Telephone Switches, servers, Relays UPS onto racks including jumper cable from patch panel to switches. Patch Cords furnished by EC as indicated in Data Section above.	BCSD	BCSD	
Switches or relays to interface with School Copper wire phone system.	BCSD	BCSD	
Wiring/Conductivity and wiring/cable type to interface from Switch/Relay with School Cooper wire phone system (IDF Closet to new Mini PBX).	EC	EC	
Provide 25 pair telephone cable from new Mini PBX to Main PBX in Basement. This shall include termination on both ends, label, test for continuity and sound. Provide report.	EC	EC	
Elevator Alternate E-2 - Provide Cat. 6 to Mini PBX	EC	EC	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Audio / Visual			
Rough-in: Conduit drops in walls, wiremold (finished area), conduit (unfinished area), conduit sleeve, junction box (wall and/or ceiling type), outlet box, floor box, poke-thru, cover plate with female bulk head, supports.	EC	EC	
Power -Audio / Visual Equipment.	EC	EC	
Low Voltage Wiring (HDMI and Cat 6) - Classroom Audio / Visual Equipment from teachers Desk to Interactive Boards.	EC	EC	
In wall combo boxes, cover plate, bulk heads for Data and HDMI, Booster for HDMI Cable over 50'-0".	EC	EC	
Interactive Boards including mounting bracket, Projectors, PC's, Lap Tops, I-Pads, Chrome Carts in classrooms.	BCSD	BCSD	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Audio / Visual(Continued)			
Stand-alone Sound System, Microphones, Recording Equipment, Devices, Low Voltage Wiring, supports, Programming, Commissioning, Training, Etc. Refer to Drawings for Locations.	EC	EC	Refer to Specificaton Section 11 6020 Audio Visual.
Projector mounting and Projector Screens.	GC	GC	Refer to Specificaton 11 5213 Projection screen.
In-wall blocking for equipment Support. EC to coordinate equipment with GC.	GC	GC	Blocking shall be coordinated with BCSD
Provide cut out relay for stand-alone sound system.	EC	EC	Refer to Specification Section 11 6020 Audio Visual.

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Security Cameras			
Rough-in: Conduit drops in new walls, wired to outlet, conduit sleeve, junction box (durable wall and/or ceiling type to support camera), supports.	EC	EC	
Camera Cat 6 Cable, Supports - J-Hooks, fire rated zip ties.	EC	EC	
Camera Cat 6 Cable - From Camera J-Box to Patch Panel. Provide 5'-0" pig tail @ each J- Box. Tag both ends of cable. Include patch panel and patch cords. Test cable as per Spec and provide report.	EC	EC	
Type written address specialty nomenclature at each Camera and patch panel.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Camera mounting brackets.	Owner Assigned Security Vendor	EC	
Camera and any other parts and smarts.	Owner Assigned Security Vendor	EC	EC shall provide lifts to Owner Assigned Security Vendor to access exterior areas and within Cafetorium.

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Camera's (Continued)			
Camera Lens Adjustment, Camera Adjustment, sequencing, commissioning, etc.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	EC shall provide lifts to Owner Assigned Security Vendor to access exterior areas and within Cafetorium.
Camera Switch, DVR, Server, Programming, integration, Licenses.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Interface and provide conductivity for Cameras to data system.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Setup the Cameras to be viewed on Monitors.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Interface and provide conductivity and programming to Putnam County Police Departments.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Door Access			
Conduit stub up and junction box (JB) at door for fob key, 120V Power for low voltage transformer/power supply at doors. (Leave 2' pigtail).	EC	EC	
Electric Strike with Door Hardware, Door contacts frame mounted.	GC	GC	
Existing Walls Chop Brick and/or Block to install JBs	EC	EC	
New Walls - Chop Brick and/or Block to install JBs	GC	GC	All wring in conduit by EC shall be concealled. No surface mounted wiremold or conduit allowed.
Cable "Banana Peel back Cable" from Access Controller box to JB above door. EC will leave 5'-10' pigtails and labels on both ends. Also include Cat. 6 Cable from Access Controller box to switch on data rack.	EC	EC	
Access Controller, Door Fob Reader, low voltage transformer/power supply mounted in JB above door, Fob programming, REX and the like. Any other associated parts and smarts	Owner Assigned Security Vendor	EC	
Power for Access Controller/transformer	EC	EC	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Fire Alarm System			
Rough-in: Conduit drops in walls, MC Cable, wiring, wiremold, conduit, conduit sleeve; J-box (wall and/or ceiling type), cover plate, supports.	EC	EC	
Fire Alarm Devices - Horn/Strobe, Speaker/Strobes, Strobes, Manual Pull station, smoke/heat detectors, duct detector, DGP, F.A.C.P. Expansion cards, relays, Annunciator, Carbon detectors, Gas Detectors, etc.	EC	EC	
Magnetic Door Holders.	GC	GC	
The F.A.wiring for Magnetic Door Holders (MH). Include line voltage. Provide high power addressable control relays to interface with MH.	EC	EC	
F.A. Devices address labelling at each device.	EC	EC	
Fire Alarm Floor Layout Plaque.	EC	EC	

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Fire Alarm System (Continued)			
Fire Alarm Programming & Start-up	Onwer Assigned F.A. Vendor	Onwer Assigned F.A. Vendor	F.A. Vendor to coordinate with owner all room numbers/designation before the start of programming.
Commissioning (Third Party)	Owner Third Party Commissioning	Owner Third Party Commissioning	Owner Assigned F.A. Vendor and EC to assist Third Party Commissioning Agent.

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
P.A. System and Clock			
Rough-in: Wiremold, conduit, conduit sleeve; J-box, outlet box, supports.	EC	EC	
P.A. System Cable Support - J-Hooks, fire rated zip ties.	EC	EC	
New P.A. System Cable - From indicated rooms to Main P.A. Rack. Tag both ends of cable, Test cable as per Spec and provide report.	EC	EC	
P.A. System Speaker, Call-In, Volume Attenuator, power supplies, expansion cards.	EC	EC	
P.A. System Programming.	EC with Vendor	EC with Vendor	
Provide cut out relay for stand-alone sound system.	EC	EC	
Wireless Clocks.	EC	EC	
LIGHTING CONTROLS			
Lighting controls (Complete Installation included and not limited to wiring, conduit, supports, Programming, etc.)	EC	EC	
Commissioning (Third Party)	Owner Third Party Commissioning	Owner Third Party Commissioning	Electrical Contractor shall assist Third Party Commissioning Agent.

Brewster CSD - Package #2: Matrix of Building System Reponsibility

Work Description	Furnished By	Installed By	Comments/Response
Mechanical Equipment Controls			
All low voltage wiring and conduit in unfinished areas, line voltage circuit for mechanical equipment, installation, tie-ins, update programming for heating and Cooling to BMS system.	HVAC Sub Controller Contractor	HVAC Sub Controller Contractor	Refer to Specification Section 23 00 00 for additional information.
Commissioning (Third Party)	Owner Third Party Commissioning Agent	Owner Third Party Commissioning Agent	HVAC Sub Controller Contract and HVAC Contractor shall assist Third Party Commissioning Agent.
BCSD interfaces with District Network IP Address	HVAC Sub Controller Contractor	HVAC Sub Controller Contractor	
Network Drops to equipment's	HVAC Sub Controller Contractor	HVAC Sub Controller Contractor	

SECTION 01 7000
EXECUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Inspections prior to start of work.

B. Examination, preparation, and general installation procedures.

C. Requirements for alterations work, including selective removals.

D. Site scoping.

E. Construction layout.

F. Field engineering.

G. General installation of products.

H. Progress cleaning.

I. Protection of installed construction.

J. Correction of the Work.

K. Pre-installation meetings.

L. Removals and dust control.

M. Cutting and patching.

N. Land surveying services.

O. Surveying for laying out the work.

P. Dust control

Q. Cleaning and protection.

R. Final Cleaning.

S. Starting of systems and equipment.

T. Demonstration and instruction of Brewster Central School District personnel.

U. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

V. General requirements for maintenance service.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

G. Section 01 3553 - Site Safety and Security Procedures

H. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties.

I. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

J. Section 01 9113 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

K. Section 01 2100 - Allowances:

L. Section 07 8400 - Firestopping.

M. Section 312301 - Excavation, Backfill and Compaction.

N. Section 32 1810 Erosion Control And Inspections of Sediment Controls.

O. Divisionn 33 Utilities for site utilities.

P. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

Q. Reference Drawing - Site Safety Plan.

1.4 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

B. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement; 2002.

C. SMACNA (SRM) Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

D. State Plane Coordinate System for New York.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers and Construction Manager.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of all documents, sealed signed by the Land Surveyor, and stating that the work in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.
   4. Indicate any discrepancies from the contract documents on each required survey.

C. Certified Surveys: Submit two copies signed by land surveyor or professional engineer for each of the surveys required along with a digital copy.

D. Submit two copies signed by scoping firm indication of all piping locations.

E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

F. Cutting and Patching: Refer to Section 01 7310 - Cutting and Patching for requirements.

G. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.7 QUALIFICATIONS

A. Refer to individual sections for additional requirements.

B. For surveying work, employ a land surveyor registered in New York and acceptable to Architect or Construction Manager . Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

C. For field engineering employ a professional engineer of the discipline required for specific service on Project, licensed in New York. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in New York. Refer to Section 31 4260 Excavation Support and Protection for additional requirements.

1.8 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Brewster Central School District.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
   2. Outdoors: Limit conduct of especially noisy exterior work to hours within the local Noise ordinances.
   3. Indoors: Limit conduct of especially noisy interior work to the hours of 4:30 Pm and 10:30 PM when school programs and activities will not be disrupted and approved by Construction Manager.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

I. All crane picks, material delivery, etc; must be coordinated with Owner and Construction Manager and shall not lift over any occupied area of the building.This work must be done on off hours. Crane location shall be carefully chosen and reviewed by Construction Manager to ensure maximum safety for all building and site inhabitants. Crane picks must not be conducted during academic hours within 20 feet of an occupied building.

1.9 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Brewster Central School District occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Brewster Central School District's activities.

H. General: Each Contractor includes general coordination of the entire work of the project, including preparation of general coordination drawings, diagrams and schedules and control of site utilization from the beginning of construction activity through project closeout and warranty periods .

I. All Prime Contractors and their subcontractors shall allow sufficient time to inspect and accept the work of the previous Contractors. Should any discrepancies be discovered, the Construction Manager shall be notified within 24 hours of discovery so that corrective action can be agreed to and taken (by all necessary parties) without affecting the progress of any Contractor or the work.

J. Alterations: Where applicable, requirements of the contract documents apply to alteration work in the same manner as to new construction. Refer to drawings for specific requirements of alteration work. Primarily, alterations can be described as normal architectural, mechanical and electrical alterations. Contractors shall review phasing and scheduling of the work to understand that certain areas of work must be completed and occupied prior to start of other work. This is essential to the Owner in their ability to maintain the educational programs during construction.

K. All disconnect and/or tie-in work involving any utilities that would interfere with the ongoing operations of the Owner shall be completed on an after-hours basis. The performance of this work shall be projected on the required schedules and the Owners Representative is to be notified at least forty-eight hours in advance of commencing this work. All overtime and standby personnel necessary to complete these tie-ins shall be the responsibility of the Prime Contractor performing the work.

1.10 CODES, PERMITS, FEES, ETC. Refer to Section 01 4100 Regulatory Requirements

1.11 MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

A. Pursuant to NYS Labor Law §220-h - On all public work projects all laborers, workers and mechanics working on the site are required to be certified as having successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project.

PART 2 PRODUCTS

2.1 MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 2500 - Substitution Procedures.

D. Barriers shall be constructed of sturdy lumber having a minimum size of 2 x 4.

1. Signs shall be made of sturdy plywood of 1/2" minimum thickness and shall be made to legible at a distance of 50 feet.

2.2 CERTIFIED SURVEYS

A. Survey work shall be the responsibility of Contract #1 General Construction Contractor.

B. Responsibility included all provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.

C. Provision of facilities and assistance necessary for Construction Manager to check lines and grade points placed by Contractor.
   1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for allowances work have been completed and accepted by Construction Manager.

D. Certified Surveys:
   1. Certified Surveys: Submit two copies along with digital copy signed by land surveyor or professional engineer for each the following surveys:
      a. Foundation Survey: After completion of foundations, as-built survey shall be submitted before continuing with the work.
      b. Anchor Bolt Survey: After installation of all column anchor bolts, as-built survey shall be submitted.
         a) Dimension(s) between centerline of column anchor bolts and edge of foundation wall and/or brick shelf.
            (a) **No steel erection shall proceed until all corrections are completed.**
      c. Steel Survey: After completion of steel erection, surveyor shall survey steel indicating:
         a) Actual elevations to top of steel, plumbness and alignment of all columns, beams and.
         b) Dimension(s) between centerline of steel and edge of foundation wall, lintels and/or brick shelf.
            (a) **No masonry work shall proceed until survey is submitted and corrections are made**.
      d. Final Survey: Before substantial completion, the Surveyor shall prepare a final property survey showing significant features (real property) that have resulted from construction of the project, including underground utilities, tanks and similar work install under all contract.
         a) Each prime contractor shall provide related information to the surveyor for the work installed under their contract. Include on the survey a certification, signed by the Surveyor, to the effect that the principal lines and levels of the project are accurately positioned as shown on the drawings.
         b) Show, where applicable, 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.
         c) Final Survey: Submit electronic copy on flash drive showing the Work performed and record survey data.

2.3 SITE SCOPING

A. Site Scoping shall be the responsibility of the Contract #1 General Construction .

B. Call ProTek (718) 472-2304 or info@ProTekLocating.com, before beginning any excavation at least five (5) working days prior to the start of construction, and locate and identify all underground utilities etc.

C. Submit two copies signed by scoping firm indication of all piping locations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify Construction Manager of any discrepancies immediately in writing before proceeding to lay out

the work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.

B.

C. Prior to start of construction take photographs, video's or similar documentation as evidence of existing project conditions as follows:
   1. Interior views: Each room and areas of outside work area which could be construded as caused by the contractor.
   2. Exterior views: Each area of work and areas of outside work area which could be construded as caused by the contractor.

D. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

E. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

F. Examine and verify specific conditions described in individual specification sections.

G. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

H. Verify that utility services are available, of the correct characteristics, and in the correct locations.

I. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect and Construction Manager five (5) working days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copies to Architect and Construction Manager, participants and those affected by decisions made.

3.4 LAYING OUT THE WORK

A. Professional land surveyor shall verify locations of survey control points prior to starting work.

B. Coordinate field engineering services with Contractor's subcontractors, installers, suppliers, and other prime contractor(s) as appropriate.

C. Check the location, line and grade of every major element as the work progresses. Notify the Construction Manager when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without Construction Manager concurrence of the remediation plan. Promptly notify Construction Manager of any discrepancies discovered.

D. Contractor shall locate and protect survey control and reference points.

E. Control datum for survey is that indicated on drawings.

F. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

G. Promptly report to Construction Manager the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

H. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Construction Manager.

I. Utilize recognized engineering survey practices.

J. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

K. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

L. Periodically verify layouts by same means.

M. Maintain a complete and accurate log of control and survey work as it progresses.

N. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

O. Land Surveying:
   1. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor's expense by a surveyor licensed in New York, and approved by the Construction Manager.

P. Construction Surveying:
   1. General: Perform surveying as applicable to specific items necessary for proper execution of work.
      a. Structure: Stake out structures, including elevations, and check prior to and during construction.
      b. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.
      c. Road: Stake out roadway elevations at 50 foot (15.24 m)50-foot intervals on tangent, and at 25 foot (7.62 m) intervals on curves.
      d. Cross-sections: Provide original, intermediate, and final staking as required, for site work and other locations as necessary for quantity surveys.
      e. Record Staking: Provide permanent stake at each blind flange and each utility cap is provided for future connections. Use stakes for record staking of material(s) acceptable to Construction Manager.
      f. Structural Frame: Upon completion, certify location and plumbness.
   2. Surveying to Determine Quantities for Payment.
      a. For each application for progress payment, perform such surveys and computations necessary to determine quantities of work performed or placed. Perform surveys necessary for Construction Manager to determine final quantities of work in place.

b. Notify Construction Manager at least 24 hours before performing survey services for determining quantities. Unless waived in writing by Construction Manager, perform quantity surveys in presence of Construction Manager.

3. Record Log: Maintain a log of layout control work. Record any 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.
4. Use by the Construction Manager: The Construction Manager may at any time use line and grade points and markers established by the Contractor. The Contractor's surveys are a part of the work and may be checked by the Construction Manager at any time.
5. Accuracy:
   a. Establish Contractor's temporary survey references points for Contractor's use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
      a) Horizontal accuracy of easement staking: Plus or minus 0.1 feet (30.5 mm).
      b) Accuracy of other staking shall be plus or minus 0.04 feet (12.2 mm) horizontally and plus or minus 0.02 feet (6.1 mm) vertically.
      c) Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
6. Construction Manager reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.5 REMOVAL AND DUST CONTROL

A. The following procedures shall be followed when removals will create dust:
   1. Asbestos and lead containing material shall be removed as per asbestos and lead abatement sections of the specifications.
   2. Exterior
      a. Work must be in compliance with OSHA Construction Standard (29 CFR 1926.62).
      b. Windows directly below, above and adjacent to the work area shall be closed.
      c. Provide tarps on the outside of the building to catch all dust, debris and paint chips when items are being removed and installed.
   3. Interior:
      a. Floor surfaces shall be provided with a minimum of one layer of six mil plastic.
      b. All air vents in the room shall be closed, shut off and sealed.
      c. Access to all rooms undergoing removals shall be restricted to prevent unauthorized entry.
      d. All TV's, smart boards, furniture, books and clocks, moveable objects will be removed by the Owner. Items to remain, floors and fixed furniture, etc. shall cover with a six mil plastic by the General Construction Contractor Contract #1.
      e. Owner shall reinstall objects to their original location.
      f. All corridors from renovated areas to exitways, used by Contractors, shall be mopped and left clean daily by the General Construction Contractor Contract #1.
   4. General Construction Contractor Contract #1 shall provide labor for daily cleanup on the interior and the exterior of the building as required or directed by the Construction Manager. Any visible debris shall be removed prior to occupancy the following day.
      a. Only wet cleaning methods and/or HEPA vacuuming shall be used to clean.
   5. All debris shall be disposed of properly in accordance with Federal, State and Local Regulations. Refer to Section 01 5000 - Temporary Facilities and Controls and asbestos and lead abatement sections for containers required.

6. Do not leave any openings unprotected at end of work day or during periods of excessive cold weather or precipitation.
7. At completion of each work area HEPA vacuumed and wet wiped.

3.6 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Saw cut all concrete slabs and asphalt paving.

E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

G. Make neat transitions between different surfaces, maintaining texture and appearance.

3.7 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Owner's Representative before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.
   2. All Prime Contractors are advised to exert utmost care and diligence when working in or near any existing buildings or sitework which is to remain. The absence of protection around such items shall not excuse the Prime Contractor from his liability to provide protection. Any damage to the existing buildings, sitework or facilities shall be repaired and expensed to the responsible Prime Contractor.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   3. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, and Electrical): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.

2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    a. Identify new equipment installed, but not in service, with appropriate signage or other forms of identification. indicating "Not in Service".
    b. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    c. Provide temporary connections as required to maintain existing systems in service.
    d. Perform all switchovers, shutdowns, etc after hours, weekends, holidays or times when the building is not occupied. All switchover scheduling shall be approved by the Owner.
4. Verify that abandoned services serve only abandoned facilities.
5. Remove conduits, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
2. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.8 CUTTING AND PATCHING

A. Refer to Section 01 7310 - Cutting and Patching.

3.9 SPECIAL REQUIREMENTS

A. All existing systems are required and shall remain operational during the performance of the work.

B. Notwithstanding anything contained in the Contract Documents to the contrary, the Contractor(s) shall not be permitted to disrupt operation of any building system or any of the services without Construction Manager's prior written consent, which shall not be unreasonably withheld. Any request to perform such work shall be in writing, received by Construction Manager no less than five (5) working days prior to the commencement of the request for disruption, and shall detail:
1. The exact nature and duration of such interruption;
2. The area of the Building affected, and;
3. Any impact upon the Construction Schedule caused by such proposed temporary disruption. All Work shall be performed during the hours and on the days set forth in the Specifications.

3.10 MISCELLANEOUS PROVISIONS:

A. Except as otherwise indicated comply with applicable requirements of Division-22, 23, and 26 sections for mechanical provisions within units of general Divisions 2-14, 31,-33 work. Except as otherwise indicated, comply with applicable requirements of Division-22-26 sections for electrical provisions within units of general (Divisions 2-14) work.

B. Service Connections: Refer to Division-22, 23 and 26 sections for the characteristics of the mechanical and electrical services to be connected to units of general work. Provide units manufactured or fabricated for proper connection to and utilization of available services, as indicated. Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.

3.11 FIRE PREVENTION AND CONTROL Refer to Section 01 3553

3.12 UNDERGROUND UTILITIES

A. Broken utilities from work are the responsibility of the Contractor performing the work. Use extreme caution when uncovering utilities. If a utility is broken while uncovering because the utility was not in the exact location identified, the cost of repair is the responsibility of the Contractor.

1. Refer to paragraphs pertaining to scoping.

3.13 WATCHMAN

A. The Owner will not provide watchman. Each Contractor will be held responsible for loss or injury to persons or property or work where his work is involved and shall provide such watchman and take such precautionary measures as he may deem necessary to protect his own interests.

3.14 SECURITY SYSTEM Refer to 01 3553 - Security Procedures

3.15 VERIFICATION OF CONDITIONS

A. All openings, measurements, door frames, existing conditions and other similar items or conditions shall be field measured prior to submission of any shop drawings or manufacturers literature for approval.

1. Each Contractor shall investigate each space into and through which equipment must be moved. Equipment shall be shipped from manufacturer in sections, of size suitable for moving through restricted spaces. Where sectional fabrication and or delivery cannot be achieved, openings, enlargements etc shall be provided by each contractor whose equipment requires access, at no additional cost to the Owner.

3.16 SALVAGEABLE MATERIALS:

A. The Owner will prepare a list of salvageable items it wishes to retain. All salvageable items shall be delivered by the Contractor to a storage area designated by the Construction Manager on site. All demolished equipment etc., except those items specifically requested by the Construction Manager shall become the Contractor's property and shall be removed from the premises.

3.17 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

E. Each Prime Contractor is responsible for their own daily debris removal into containers provided by the General Construction Contractor. Working areas are to be broom swept on a daily basis by the General Construction Contractor.

F. If daily cleaning and dust protection is not provided the Contractor will be back charged for cleanup performed by employees of the Owner or a separate contractor retained by the Owner.

3.18 PROTECTION OF INSTALLED WORK

A. Each Prime Contractor is responsible to provide protection for their work.

B. Protect installed work from damage by construction operations.

C. Provide special protection where specified in individual specification sections.

D. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

F. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

G. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

1. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.19 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Construction Manager seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.20 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.21 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, balancing and Adjusting HVAC. See Division 23.

3.22 FINAL CLEANING

A. Final cleaning shall be the responsibility of Contract #1 General Construction for contracts 1, 2, 3 and 4, and all costs for final cleaning shall be included in their Base Bid. Final cleaning responsibility shall be limited to all new additions and areas where renovations occur.

B. Execute final cleaning prior to final project assessment.

1. Clean areas to be occupied by Brewster Central School District prior to final completion before Brewster Central School District occupancy.

C. Use cleaning materials that are nonhazardous.

D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

G. Clean filters of operating equipment.

H. Clean debris from roofs, gutters, downspouts, overflow drains, area drains, and drainage systems.

I. Clean site; sweep paved areas, rake clean landscaped surfaces.

J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

K. Areas being altered or renovated by each prime only for their work shall be cleaned by the Contractor working in the area. Example: Intercom system or fire alarm system being replaced in classrooms or areas not being altered; unit ventilators, convectors, controls, etc. being replaced altered, etc., plumbing fixtures installed in classrooms not being altered.

L. 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.

M. 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.

N. Cleaning Agents: Use cleaning materials and agents recommended by the 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.

O. Remove tools, construction equipment, machinery, and surplus material from Project site.

P. Remove snow and ice to provide safe access to building.

Q. 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.

R. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

S. Sweep concrete floors broom clean in unoccupied spaces.

T. Remove labels that are not permanent.

U. Touch up and otherwise repair and restore marred, exposed finishes and surfaces evidence of repair or restoration. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show

V. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

W. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

X. Replace parts subject to unusual operating conditions.

Y. Clean ducts, blowers, and coils if units were operated without filters during construction.

Z. 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.

AA. Leave Project clean and ready for occupancy.

AB. 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.

3.23 CLOSEOUT PROCEDURES Refer to Section 01 7800

END OF SECTION

SECTION 01 7310
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. This Section includes procedural requirements for cutting and patching.

1. Refer to other Sections for specific requirements and limitations applicable to cutting and patching.
2. Requirements of this Section apply to all contracts. Refer to various sections and divisions of these specifications for other requirements and limitations applicable to cutting and patching.
3. Contractor acknowledges that the work involves renovation and alteration of existing improvements and, therefore, cutting and patching of the work is essential for the Project to be successfully completed. Each Contractor shall perform any cutting, altering, patching and fitting of the work necessary for the work and the existing improvements to be fully integrated and to present the visual appearance of an entire, completed, and unified project. In performing any work which requires cutting, fixing, or patching, Contractor shall use its best efforts to protect and preserve the visual appearance and aesthetics of the project to the reasonable satisfaction of both the Owner and the Architect.
4. Each Contractor shall do all cutting, patching, repairing as necessary for their work In all cases, the cutting, patching, repairing and finishing shall be performed by mechanics skilled in the particular trade required at no additional cost to the Owner.

1.3 RELATED SECTIONS

A. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.

B. Divisions 2 through 14 Sections for additional requirements and limitations applicable to cutting and patching individual parts of the Work.

C. Requirements in this Section apply to each contractor and installations. Refer to all Division Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.4 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.

1.5 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. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. 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.

1.6 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 the following 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. Primary operational systems and equipment.
a. Air or smoke barriers.
b. Fire-protection systems.
c. Control systems.
d. Communication systems.
e. Conveying systems.
f. Electrical wiring systems.
g. 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.
a. Membranes and flashings.
b. Exterior curtain-wall construction.
c. Equipment supports.
d. Piping, ductwork, vessels, and equipment.
e. 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.

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.

1.7 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.

B. Prior to cutting and patching verify with Construction Manager all existing warranties in effect.
1. Portions of the exist roofs are under warranty. Work must be reviewed and approved by the manufacturer of the warranty.

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.

B. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. 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.

B. 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. A sufficient time in advance of the construction of new walls, floors, pavement, or roofing etc. Each Contractor shall be responsible for properly locating and providing in place all sleeves, inserts and forms required for work.

C. 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.

D. All cutting of holes in existing walls, existing floors, existing roofs, existing ceilings, etc. for the removal of any existing work (including, but not limited to ducts, fans, fixtures, motors, equipment, drains, wiring, conduit, etc.) or for the installation of any new work shall be done in a neat manner by each Contractor. Debris caused by such cutting or removals will be removed by each Contractor.

E. Where sleeves, inserts or openings are required in existing walls, floors, roofs, vaults and pavements of existing buildings or structures, all necessary cutting, furnishing and installing of sleeves, inserts, lintels, etc., shall be done by each Contractor.

F. Contractor(s) are hereby notified that the existing walls in the existing building are concrete mansory unit. All openings in existing walls shall be provided with steel lintels, minimum 4" bearing each side and 8" wide x wall thickness concrete masonry units filled solid on each side of the opening for proper support.

G. Adequate blocking, fastening, etc., required to support equipment, casework, etc., from existing terra cotta walls shall be included as required to complete work.

H. All surfaces where existing items are removed from existing walls, floors, ceilings, roofs, vaults, etc. shall be patched to match existing surfaces.

1. All patching shall be provided with prime and finish paint or other material to match existing. In areas indicated to be completely painted/finished by the Contractor for Construction , other prime contractors shall be required only to patch existing surfaces to match as required to accept new finishes.
2. Proceed with patching after construction operations requiring cutting are complete.

I. Removals of selected portions of the building for alterations is included in Section "Selective Removals".

J. 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.

K. Each Prime Contractor shall be solely responsible for removing and replacing the existing ceiling tiles and grid in areas of the existing building where their work is required but new ceilings are not scheduled. If the existing ceilings are damaged and cannot be replaced to the satisfaction of the Owner, the responsible Prime Contractor shall be solely responsible for replacing, in kind, the existing ceilings with new tile and grid. A qualified Contractor, acceptable to the Owner, shall perform all ceiling replacements.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WASTE MANAGEMENT REQUIREMENTS

A. Brewster Central School District requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor(s) shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
   5. Crushing of materials.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 7000 - Execution: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.4 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Brewster Central School District.
3. Landfill Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
    c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
    c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
    a. Identification of material, including those retrieved by installer for use on other projects.
    b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
    c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards (cubic meters).
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Brewster Central School District, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7600
PROCEDURES AND SPECIAL CONDITIONS FOR SEPARATE PRIME CONTRACTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. The types of minimum requirements for procedures and performance or control work of a general nature, to be fulfilled collectively by prime contractors, and must be participated in by each prime contractor (where applicable) even though certain lets of work may be assigned to a specific prime contractor.

1.3 RELATED REQUIREMENTS.

A. Section 01 1000 Summary of Contracts: Use of premises.

B. Section 01 1010 - Milestone Schedule.

C. Section 01 3216 - Construction Progress Schedule

D. Section 01 5000 - Temporary Facilities and Controls.

E. Section 01 6190 - Matrix of Building System Responsibilities

F. Section 01 7000 - Execution.

G. Refer to reference drawing, "Site Safety Plan".

1.4 SUBMITTALS

A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

B. Shop Drawings: Indicate exact position of each specified item.

C. Samples: Submit sample when requested.

D. Manufacturer's Installation Instructions: Provide installation requirements and rough-in dimensions.

E. Project Record Documents: Record actual locations of each item.

1.5 MISCELLANEOUS PROVISIONS:

A. Except as otherwise indicated comply with applicable requirements of Division-22, 23, and 26 sections for mechanical/Electrical provisions within units of general Divisions 2-14, 31, 32, and 33.

B. Service Connections: Refer to Divisions-22, 23, 26, 31, 32, and 33 sections for the characteristics of the mechanical and electrical services to be connected to units of general work. Provide units manufactured or fabricated for proper connection to and utilization of available services, as indicated. Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.

1.6 DISSIMILAR METAL

A. Wherever dissimilar metals would otherwise come in contact with each other, they must be isolated by use of an approved, permanent non-staining material. Where one of the metals is aluminum, a coat of zinc-chromate primer followed by a coat of alkali-resistant bituminous paint shall be applied.

1.7 MODIFICATION OF WORK

A. Where necessary, because of job or space conditions, the Contractor shall modify his work to suit these conditions, within accepted standards and limitations. No allowance will be made for this modification.

1. If work is executed without regard for other trades as cited above, the Construction Manager may direct its removal and modification. No allowance will be made for this work.

1.8 QUIET OPERATION

A. All work shall operate under all conditions of load without any sound or vibration which, in the opinion of the Architect or Construction Manager, is objectionable. In the case of moving machinery, sound or vibration noticeable outside the room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Architect or Construction Manager shall be corrected in an approved manner by the Contractor at his expense. Provide vibration isolators on all moving machinery.

1.9 ACCESSIBILITY, SIZE AND LOCATION OF EQUIPMENT AND WORK

A. Each Contractor shall investigate each space into and through which equipment must be moved. Equipment shall be shipped from manufacturer. in sections. of size suitable for moving through restricted spaces.

B. Each Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and sizes of duct enclosures, for the proper installation of his work. They shall cooperate with the all other contractors whose work is in the same spaces and shall advise the Construction Contractor of their requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

C. Each Contractor shall locate all equipment, which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to: valves, traps, cleanouts, motors, controllers, switch-gear, drain point, etc. Minor deviations from drawings may be made to allow for better accessibility, but changes of magnitude or which involves extra cost shall not be made without approval.

1.10 ACCESS DOORS

A. Refer to Section 08 3100 - Access Doors and Panels

B. Each Contractor shall provide all access doors for all dampers, valves, cleanest, junction boxes, pull boxes or similar items located above finished ceilings or ceiling breaks or extensions, behind finished walls or below finished floors. The access doors shall be stainless steel or steel, hinged types as required for type of construction.

1. Where feasible locate all dampers, valves, cleanest, junction boxes, pull boxes or similar items above acoustical panel tile ceiling.
2. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.
3. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.
4. Where electric motors or heaters are installed above hung ceilings, provide disconnect switch in hung ceilings within reach from access doors, unless switch is located on wall immediately below.
    a. Disconnect switch shall be provided by the Contractor furnishing the equipment unless shown otherwise.
5. All access doors in Toilets, Janitor Closets, Science and Prep Rooms, Storage Rooms, and Kitchen and Food Related Areas and similar spaces shall be watertight and constructed completely of stainless steel type 302.

1.11 MACHINERY GUARDS

A. Moving parts of machinery exposed to contact by personnel shall be guarded by a barrier of a type a approved by the Architect.

1. Exposed moving parts such as belts and couplings shall have 3/4" No 16 gauge galvanized expanded metal mesh guards, with all edges rounded. Guards shall be 1-1/2" x 1-1/2" x 1/8" angle iron framed properly supported.

2. All machinery guards covering the ends of motor or equipment shafts shall have openings for the insertion of a tachometer.

1.12 DRIP PANS

A. The respective mechanical contractor shall provide 20 oz. copper all soldered reinforced pans with 2" high lips under all heating, domestic water piping, soil and waste piping which runs over electric switchboards, mounting boards, motors or electric motor starters. Each drip pan shall have a copper drain piped to discharge where shown on the drawings, of if not shown, to discharge to the nearest available open drain where directed by the Construction Manager. All piping shall be copper 1-1/2" minimum in diameter.

1.13 CONCEALMENT OF UNSIGHTLY INSTALLATIONS

A. Piping and conduit work is to be run concealed in all areas, in partitions, construction and pipe spaces. Obtain exact dimensions locations of partitions, use special care to see that no Joints, fittings, piping or conduit will be exposed except as shown or specified. In the event of any unsightly exposed piping or conduit work or unsightly partitions resulting, the responsible Contractor shall rebuild, and re-run lines at his own expense.

1.14 VERMIN CONTROL

A. All piping, ducts and the like passing through non rated walls, floors, slabs, ceilings and other solid construction, shall be sealed to prevent the passage of vermin.

1. These seals shall be by means of Johns-Manville Uni-seal or Duxseal packed sleeves or other approved construction. Philip Carey Corp., and 3M Company, shall be considered equal.

B. All piping, ducts and the like passing through rated walls, floors, slabs, ceilings and other solid construction, shall be fire stopped in accordance with Section 07841 Through Penetration Firestop Systems.

1.15 CHEMICAL FUMES AND OTHER CONTAMINATES

A. Each Contractor shall be responsible for the control of chemical fumes, gases and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc., to ensure they do not enter occupied portions of the building or air intakes.

B. Each 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 manufacturer’s recommendations before a space can be occupied.

1.16 PROTECTION OF WORK AND MATERIAL

A. Each Contractor shall be responsible for the protection of all his work and shall make good all damage which may occur to his work prior to the date of the final acceptance. Ends of piping and/or conduit shall be plugged during construction to prevent debris and water from entering therein.

1. Mechanical and electrical equipment shall be delivered and stored at the site, properly packed and crated. Each piece of equipment shall remain packed and crated at location until final installation. uninstalled and installed equipment and materials shall be protected against damage by weather, water, paint, plaster, moisture, fumes, dust or physical damage.

1.17 DAMAGE TO OTHER WORK

A. Each Contractor shall be held responsible for and be required to make good at his own expense any and all damage done to the Owners property, adjoining property, and/or to any work or material in place in the premises, or included in his contract, which is caused by his work or workmen. The decision as to which contractor is responsible for specific damages shall be the responsibility of the Architect/Engineer.

1. From the commencement to the completion of the Project, each Contractor shall keep the parts of the work and the buildings free from accumulation of water no matter what the source or cause of

1.18 SUPPORTS FROM OVERHEAD CONSTRUCTION

A. Where overhead equipment does not permit fastening of supports for equipment, furnish at no additional cost to the Owner, additional framing, supplementary steel, etc., as required, subject to approval by the Construction Manager. Specific types of hangers and supports which are required in certain areas are to be installed as indicated on the drawings.

1.19 ESCUTCHEONS

A. Where exposed un-insulated mechanical piping or conduits pass through floors, ceilings or walls of finished rooms, apply, approved hinged escutcheon of sufficient outside diameter to cover the pipe sleeve.
   1. Where exposed insulated pipes pass through walls, floors, or ceilings of finished rooms, provide escutcheons fastened to the sleeves.
   2. Finish shall be stainless steel in toilets, janitor's closet and similar "wet areas". Submit samples.

1.20 PUMPING

A. The General Construction Contractor for contracts 1, 2, 3 and 4 shall provide, maintain and operate pumps of adequate capacity required to maintain excavations, pits, trenches and depressions within the Contract Limit Lines as well as the Buildings free of water accumulated at any time and as necessary to permit the proper installation of the work required under all contracts. Disposal of pumped water shall be done with due respect to the rights of adjoining buildings. All costs in connection with the removal of water as above provided for shall be borne by the Contractor.

1.21 FLASHINGS

A. Refer to Section 07 6200 - Sheet Metal Flashing and Trim.

B. Cap Flashing:
   1. All cap flashings for HVAC, Plumbing and Electrical work shall be provided by the respective HVAC, Plumbing and Electrical contractor, except where specifically indicated or specified to be provided by the General Construction Contractor Contract #1. Installed by GC.

C. Base Flashing:
   1. All base flashings and pitch pockets for all contracts to be installed in new roofing system shall be provided by each contractor.
      a. All base flashing and pitch pockets for equipment installed on existing roof systems shall be furnished by rerspective contractor and installed by the Construction Contractor. Work shall be compatible to existing roofing system and performed by installers acceptable to the roofing manufacturer so as not to void any existing roofing warranties. Prior to starting work on existing roof systems notify Construction Manager and roofing manufacturer.
      b. All base flashing shall be a minimum 12" above roof membrane.

1.22 WATERPROOFING

A. Where any work pierced waterproofing, including waterproof concrete, the method of installation shall be approved by Architect or Owner's Representative before work is done. Each Contractor shall furnish all necessary sleeves, caulking and flashing required making openings absolutely watertight.

1.23 SALVAGEABLE MATERIALS:

A. The Owner will prepare a list of salvageable items it wishes to retain. All salvageable items shall be delivered by the Contractor to a storage area designated by the Construction Manager on site. All demolished equipment etc., except those items specifically requested by the Construction Manager shall become the Contractor's property and shall be removed from the premises.

1.24 CONSERVATION:

A. General: It is a requirement for each prime contractor's supervision and administration of the work, that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials.

1.25 MATERIALS AND WORKMANSHIP

A. All material, apparatus and accessories shall be new and of the best quality of their respective kind.
   1. Work and materials shall conform to the latest applicable requirements of the New York State Building Code including Reference Standards or National Board of Fire Underwriters and Local Municipal codes, where applicable. Refer to Section 01 4100 - Regulatory Requirements.
   2. All labor shall be performed in a first-class workmanlike manner, and adequate supervision must be provided to insure against neglect or faulty installations of any part of the systems during the progress of the work.
   3. Any inferior material and/or workmanship shall be removed at once, when directed by the Architect or Construction Manager and replaced with material and workmanship in accordance with the true intent and meaning of the drawings and specifications, at no additional cost to the Owner.
   4. If material or equipment is installed before it is approved, as to manufacture and shop drawings, the Contractor shall be liable for the removal and replacement at no extra charge, if in the opinion of the Architect or Construction Manager the material or equipment does not meet the intent of the drawings and specifications.
   5. If after installation (with or without prior approval) operation of any equipment proves to be unsatisfactory by reasons of defects, workmanship, error or omissions, the Owner reserves the right to operate equipment until it can be removed from service for correction or replacement by the Contractor. The Contractor shall pay for the repair of all damage to work of other prime contractors caused by this defective equipment and its correction or replacement.
   6. No advertising matter exclusive of nameplates containing required data shall appear on any equipment without the written consent of the Architect or Construction Manager. The equipment furnished under this specification shall be essentially the standard product of a manufacturer regularly engaged in the manufacture of such equipment. Where two or more units of the same class of equipment are required, the units shall be products of a single manufacturer; however, the component parts of the equipment need not be products of the same manufacturer.

1.26 SELECTIVE REMOVAL OF EXISTING PLUMBING, HEATING, ELECTRICAL AND RELATED WORK

A. Comply with Section 01 7330 Selective Removals or and Divisions 22, 23 and 26.

B. All selective removal work shall be in accordance with the time schedule as specified herein.
   1. All mechanical and electrical removals shall be performed as required to complete the work as intended.
   2. Electrical Contractor shall check with local utility company and implement in the work any further requirements from the utility company.
   3. Remove all plumbing, heating and electrical apparatus, equipment, specialties, drains, controls, hangers, bases supports, piping, pneumatic tubing, conduit, panels, switches, wiring, plumbing accessories and electrical fixtures, etc., that are not incorporated in the new layout or required.
   4. Where removal is indicated, or implied, or not incorporated in the new layout, the item itself is to be removed completely together with all connecting conduits, specialties, supports, controls, etc. Connecting conduits are to be removed back to the mains and panels where they are to be capped or disconnected. All abandoned open ends shall be sealed and capped or disconnected. This includes all heating, electric, water, gas, etc. Patching and finishing of all surfaces to match existing shall be performed by Contractor doing the removal.
   5. Where existing conduit, etc., enter inaccessible trenches, tunnels, shafts, walls, and ceilings, inside of the existing building, they shall be cut back at least 2" into such inaccessible spaces and shall be suitably capped and sealed by the Contractor.
   6. Each Contractor shall exercise all normal caution to prevent unnecessary cutting and damage to the existing building. Any excessive damage, as determined by the Construction Manager shall be repaired and paid for by the Contractor causing the damage.

1.27 ELIMINATION OF NOISE AND VIBRATION

A. All equipment and accessories shall operate without objectionable noise or vibration.
   1. Should operation of any one or more of the systems produce noise or vibration which is, in the opinion of the Architect or Construction Manager objectionable, the Contractor shall, at his own expense, make changes in equipment and do all work necessary to eliminate the objectionable noise or vibration.
   2. All work shall operate under all conditions of load without any sound or vibration which, in the opinion of the Architect or Construction Manager's, representative is objectionable. In the case of moving machinery, sound or vibration noticeable outside the room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Architect or Construction Manager's representative shall be corrected in an approved manner by the Contractor at his expense.
      a. Provide vibration isolators on all moving machinery.
      b. Refer to special sound control construction for band, coral and CAD rooms and Division 13 specifications.

1.28 GENERAL LABELING

A. All mechanical and electrical equipment such as unit ventilators, heating and ventilating units, exhaust fans, etc., together with their component parts, control boards, electric panels, gauges, thermometers, switches, controls, valves, dampers shall have appropriate descriptive labels, identification tags and nameplates, furnished and installed under the respective control under which the corresponding item is provided, and shall be properly placed and permanently secured to (or adjacent to) the item being installed.
   1. Submit complete schedules, listings, and descriptive data, together with samples for checking and approval before purchasing.
   2. Refer to respective M/E specifications for additional requirements.

1.29 IDENTIFICATION OF PIPING

A. The respective Mechanical Contractor shall provide on all new exposed, insulated and uninsulated piping, semi-rigid, wrap-around plastic identification markers.
   1. Each marker background is to be appropriately color-coded with a clearly printed legend to identify the contents of the pipe conformance with the Scheme for the Identification of Piping Systems (ASA A13.1-1956). Direction of flow arrows is to be included on each marker.
   2. Exposed locations for the pipe markers to be as follows:
      a. Adjacent to each valve.
         a) At each branch and riser take-off.
         b) At each pipe passage through wall, floor and ceiling construction.
         c) On all horizontal pipe runs - marked every 15 feet.
         d) At each inlet and outlet of coils, pumps, etc.
   3. Refer to respective M/E specifications for additional requirements.

1.30 PAINTING

A. All apparatus, cabinets, etc., furnished under the Mechanical and Electrical Sections of the specifications, shall be provided with a priming coat, and enamel finish. All patched surfaces and surfaces where removals have occurred (by each Contractor) shall receive a prime coat and a finish coat to match adjacent surfaces acceptable to the Architect or Construction Manager unless noted otherwise.
   1. All finish painting of new insulated and uninsulated piping, new duct work, apparatus, and appurtenances, will be performed by each contractor, unless noted otherwise.
      a. Refer to Section 09 9123 - Interior Painting for additional information.
   2. All concealed supports and ironwork not otherwise protected against corrosion shall be given two (2) coats of bituminous base paint.

1.31 TEMPLATES:

A. Each contractor shall prepare templates showing all dimensions and shall furnish all anchor bolts and sleeves required for all equipment, boilers, transformers, tanks, etc., and submit to Contractor who requires this information.

1.32 EQUIPMENT BASES

A. Each contractor shall submit for approval of the Architect, detail drawings of all equipment foundations and shall furnish all templates for his foundation.

1. Unless otherwise indicated each Contractor will furnish and install all interior bases. It is the responsibility of each Contractor to place any templates and anchor bolts and to supervise the construction of the equipment bases regardless of who installs the bases.

a. Concrete equipment bases for shall be minimum 3,000 psi test strength at 28 days and shall conform to the requirements of the Section 03300. Provide minimum 6/6 x 10/10 welded wire mesh.

1.33 MOTORS

A. Each contractor shall furnish and install the electric motors required for the motor-driven equipment supplied under his contract. The motors shall be of sufficient size for the duty to be performed, and shall not exceed their full rated load when the driven equipment is operating at required capacity under the most severe conditions likely to be encountered. The speed and horsepower for each motor are given in the schedule on the drawings, or are specified.

1. All motors shall be suitable for operating on alternating current, sixty (60) cycle frequency. Motors 1/2 horsepower and smaller shall be wound for single-phase, 60 cycle, 120 volt current. Motors exceeding 1/2 horsepower shall be designed for operation on three phase, 60 cycle, 208 Volt current.
2. Fractional horsepower motors shall be of the sealed prelubricated ball bearing type.

a. All motors shall be approved by the Underwriters Laboratories, Inc., for the service and location intended.

b. All motors shall be equipped with ball bearings unless specified otherwise in other sections of these specifications.

c. Motors for single-phase operation shall be of the capacitor type.

1.34 WIRING

A. The wiring of prewired equipment or apparatus is specified under the corresponding sections of the Specifications. The Electrical volt systems design as indicated on the Electrical Drawings and Specifications.

B. The Electrical Contractor will perform all Power wiring; however, each Contractor shall furnish all magnetic starters and automatic controls, suitable for the equipment furnished by the Contractor. Motor starters shall be installed by the Electrical Contractor.

C. Each Contractor shall prepare wiring diagrams and submit same for approval. Submit 2 copies. Two (2) approved copies with any additional instructions are to be given to the Electrical Contractor.

1. All prewired and job wired control panels for motors shall be provided with approved high interrupting capacity circuit breakers.
2. All electrical wiring for equipment where exposed to the weather (factory or field installed) shall be installed in weathertight conduits and shall be U.L. approved.

1.35 CONTROL WIRING:

A. Control wiring is required wiring, conduit, relays, contractors, electro-mechanical, hydraulic activators and solid state regulating devices either low or line voltage, to the controlled device that is regulated by the controller and necessary for the operation, controlling, sequencing etc. of the equipment or system. Control wiring shall be furnished and installed by each contractor furnishing and installing such equipment or systems.

1. Power wiring to equipment, including wiring and installation of magnetic starters and disconnect switches, where required, shall be the responsibility of the Electrical Contractor, except where required by each contractor. The Electrical Contractor shall furnish and install all disconnect switches, and install all magnetic starters where required. All magnetic starters shall be furnished by each contractor furnishing the equipment or systems.
2. Each Contractor shall supervise the wiring of all equipment included under his Contract.

1.36 MOTOR STARTERS

A. Except where specified to be motor or pedestal mounted as part of a prewired control panel furnished with the equipment they serve, all magnetic starters shall be provided by each Contractor. Magnetic starters, with thermal and under voltage protection, suitable for the voltages indicated, shall have a heater in each phase and reset button on the cover.
   1. Motors 7-1/2 HP and larger shall have Allen Bradley, Emerson Phase Guard or approved substitute phase failure relays suitable for the voltages indicated, included in the starter enclosure. Refer to specific section of specifications for special starters.

B. Motors over 10 HP shall be provided with variable frequency drive. (VFD).

C. Where the installation of phase failure non-reversing relays are required, these shall, wherever possible, be wired and installed at the equipment manufacturer's factory panel mounted equipment in connection with refrigeration equipment and temperature controls. Starters shall beAllen Bradley, Square D or approved equal.

1.37 UNDERWRITERS' LABORATORIES CERTIFICATION

A. All mechanical and electrical equipment shall bear the UL label of approval where such inspection service is furnished for the particular type of equipment.

1.38 LOCATIONS AND MEASUREMENTS

A. The locations of fixtures, appliances, conduits, etc., are specified and shown on the plans as accurately as possible, but in all cases, they are to be adjusted to the surrounding conditions. Contractor must take all measurements at the building, and should the space allotted for any appliance be inadequate, it shall be the Contractor's responsibility to immediately notify in writing, and shall he fail to do so, he must bear the expense necessary to correct the conditions. All work shall be coordinated with the work of other trades.

1.39 GROUNDING

A. Standards set forth by the latest edition of the National Electric Code, relative to the grounding of system and equipment, shall be followed together with the rules and regulations of the Utility Company. All non-current carrying metal parts shall be solidly grounded. All motor frames that are not clamped to supply conduits shall be grounded by suitable wire and ground clamp.
   1. The identified neutral wire or white wire of the interior wiring system shall be permanently grounded to the water services. The grounded wire shall be connected to the supply side of the main service switch and mechanically connected to an approved ground clamp and securely bonded to the water service at the point of entry. The ground connection shall be made on the supply side of the first main control valve. The conductors shall be protected from mechanical injury by rigid steel conduit to which the conductors shall be securely bonded in each length of connection. Conduit system shall be securely grounded to the above described ground of wiring system.
   2. Ground connections to water mains shall be made to non-current carrying metal parts of distribution panels, instrument cases, and instrument transformer cases.

1.40 JURISDICTIONAL DISPUTES

A. Refer to Section 01 1000

1.41 FIRESTOPPING:

A. All openings thru walls, floors, shafts, etc. shall be fire stopped with approved material to maintain rating. See Section 07 8400 - Firestopping.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Substantial Completion.

B. Final Completion.

C. Project record documents.

D. Operation and maintenance data.

E. Warranties and bonds.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Individual Product Sections: Warranties required for specific products or Work.

1.4 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion:
   1. Prepare a list of items to be completed and corrected, the value of items on the list, and reasons why the Work is not complete.
   2. Advise Architect and Construction Manager of pending insurance changeover requirements.
   3. Obtain and submit releases permitting Architect and Construction Manager unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

B. Prior to issuance of the Certificate of Substantial Completion, submit, in writing, a request to the Architect and Construction Manager a request to perform site inspection for the purpose of preparing a "punch list".

C. On receipt of request the Architect and Construction Manager will prepare a punch list.

D. Certificate of Substantial Completion will be issued **after completion of all punch list items** or Architect and Construction Manager will notify Contractor of items, either punch list or additional items identified by Architect, **that must be completed or corrected before a certificate will be issued**. After completion of "punch list" items submit the following:
   1. Executed Checklist for Project Closeout Form- Substantial Completion
   2. Application for Payment showing 100 percent completion for portion of the Work claimed as substantially completed the following:
   3. Manufacturer's Warranties (guarantees).
   4. Contractor's Warrantee Two (2) and all extended warrantees
   5. Maintenance agreements, if any.
   6. Manifest for disposal of Hazardous material.
   7. Manifest for disposal of material.
   8. Test/adjust/balance records. (Testing shall include db levels of all installed equipment)
   9. Maintenance Manuals and Instructions Manuals
   10. Spare parts and Attic Stock.
   11. Start-up performance reports.
   12. Changeover information related to Owner's occupancy, use, and maintenance.

13. Final cleaning.
14. Advice on shifting insurance coverage.
15. Final progress photographs.
16. List of incomplete Work, recognized as exceptions to Architect's "punch list".
17. Removal of temporary facilities and services.
18. Removal of surplus materials, rubbish and similar elements.
19. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
20. As Built Drawings.
21. Project Record Documents.

E. Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
   1. If necessary re-inspection will be repeated and the contractor shall pay for all additional inspections.
   2. Results of completed inspection will form the basis of requirements for Final Completion

1.5 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect and Construction Manager will not process a final Certificate for Payment until after the inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
      a. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

B. Following Final Inspection acceptance of work submit the following:
   1. Executed Checklist for Project Closeout Form - Final Completion.
   2. Submit a final Application for Payment according to Division 1 Section 01 2000 - Price and Payment Procedures.
   3. Architect's punch list certifying all punch list items have been completed with each item signed off by the Construction Manager and Contractor.
   4. Update final statement, accounting for final changes to the Contract Sum.
   5. Release of liens from contractor and all entitles of the contractor.
   6. Consent of Surety to Final Payment, AIA Document G707
   7. Final Liquidated Damages settlement statement.
   8. Contractor's Affidavit of Release of Liens (AIA G706A).
   9. Contractors Affidavit of Payment of Debts and Claims (AIA G706)
   10. Contractor's Certification of Payment of Prevailing Wage Rates.
   11. Contractor's Certification of Compliance that products comply with VOC requirements stated in Section 01 6116.
   12. Contractor's Certified Statement that no asbestos containing material was incorporated into the project.
   13. Asbestos manifest.
   14. Underwriters Certificate or equivalent. (By EC.)
   15. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.6 SUBMITTALS

A. Contractor shall submit all documentation identified in this section within thirty (30) working days from the time the Contractor submits the list of items to be corrected, in addition to other rights of the Owner set forth elsewhere in the Contract Documents, to include but not limited to withholding of final payment. If the documentation has not been submitted within Thirty (30) day period, the Owner will obtain such through whatever means necessary. The Contractor shall solely be responsible for all expenses incurred by the Owner, provided the Owner has advised the Contractor of this action seven 7 days prior to the culmination date by written notice.

B. Project Record Documents: Submit documents to Architect and Construction Manager with claim for final Application for Payment.

C. Operation and Maintenance Data:
   1. Refer to individual sections for other requirements.
   2. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Construction Manager and Architect will review draft and return one copy with comments.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

D. Warranties and bonds.:
   1. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Brewster Central School District.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.
   6. Approved Change Orders

G. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and approved Shop Drawings at the project site.

H. Each Prime Contractor is responsible for marking up Sections that contain its own Work and for submitting the complete set of record Specifications as specified.

I. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
   1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   2. Accurately record information in an understandable drawing technique.
   3. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

J. Content: Types of items requiring marking include, but are not limited to, the following:
   1. Dimensional changes to Drawings.
   2. Revisions to details shown on Drawings.
   3. Depths of foundations below first floor.
   4. Locations and depths of underground utilities.
   5. Revisions to routing of piping and conduits.
   6. Revisions to electrical circuitry.
   7. Actual equipment locations.
   8. Duct size and routing.
   9. Locations of concealed internal utilities.
   10. Changes made by Change Order or Construction Change Directive.
   11. Changes made following Architect's written orders.
   12. Details not on the original Contract Drawings.

K. Mark the Contract Drawings or 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.

L. 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.

M. Mark important additional information that was either shown schematically or omitted from original Drawings.

N. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

O. **Provide final record drawings on CD or USB in PDF Format.**

3.2 RECORD CAD DRAWINGS

A. Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect and Owner's Representative. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
   1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
   2. Incorporate changes and additional information previously marked on Record Prints. Delete, re draw, and add details and notations where applicable.
   3. Refer instances of uncertainty to Architect through Owner's Representative for resolution.

B. Owner will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
   1. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
   2. CAD Software Program: The Contract Drawings are available in Auto CAD 2020.

3.3 FORMAT

A. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Contractor shall certify and sign.

B. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record PDF Drawings: Organize PDF information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each PDF file.

D. Identify Record Drawing as follows:
   1. Project name.
      a. Date.
      b. Designation "PROJECT RECORD DRAWINGS."
      c. Name of Architect and Owner's Representative.
      d. Name of Contractor.
      e. Contractor shall certify and sign each drawing

3.4 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.5 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Include test and balancing reports.

O. Additional Requirements: As specified in individual product specification sections.

3.6 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Brewster Central School District's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

1. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
2. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Fuller and D'Angelo, P.C., Consultants, Construction Manager, Contractor, and Subcontractors , with names of responsible parties.
3. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
4. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
5. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
6. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

D. Arrangement of Contents: Organize each volume in parts as follows:

1. Project Directory.
2. Table of Contents, of all volumes, and of this volume.
3. Operation and Maintenance Data: Arranged by system, then by product category.
    a. Source data.
    b. Operation and maintenance data.
    c. Field quality control data.
    d. Photocopies of warranties and bonds.

E. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

1. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

F. In addition to binders all documents shall be provide in PDF format on CD or USB.

3.7 WARRANTIES and BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Brewster Central School District's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

CHECKLIST FOR PROJECT CLOSEOUT

AND PROCESSING OF FINAL PAYMENT

JOB TITLE: - Brewster Central School District CV Starr Cafetorium Addition, Interior Renovation & Related Work CV Starr Intermediate School

Project: CV Starr Cafetorium Addition, Interior Renovation & Related Work

Owner: Brewster Central School District

Architect Project #: 23505.02

CLOSE-OUT SUBMITTALS: (As Applicable. Include this checklist with submittal)

SUBSTANTIAL COMPLETION

[ ] UL Certification or equivalent.

[ ] Three (3) Ring Binder Brochures of Operation And Maintenance Manuals For All Equipment Installed on The Project Including The Following:

- [ ] Typed or Printed Instructions Covering The Care And Operations of Equipment And Systems Furnished And Installed.
- [ ] Start-up Performance Reports
- [ ] Test/Balancing Reports.
- [ ] Final Survey
- [ ] Manufacturers Instruction Books, Diagrams, Spare Parts Lists Covering All Equipment.
- [ ] Instruction of Owner's Representative In Care And Maintenance of New Equipment.
- [ ] All Approved Shop Drawings and Submittals.
- [ ] Third Party Inspections.

1. [ ] Field Reports executed by the Contractor
   - [ ] Video Training Sessions.
   - [ ] Surveys and survey logs.
   - [ ] Certificates of Compliance And Inspection. (Where Applicable Electric, Elevator, Etc.)

[ ] Spare Parts, O&M and Maintenance Materials. (Receipt Signed By Field Superintendent)

[ ] Evidence of Compliance With Requirements Of Governing Authorities (Certificates Of Inspection Electrical).

[ ] Certificates of Insurance For Products And Completed Operations. .

[ ] Fully Executed Certificate of Substantial Completion: AIA G704 (Issued by Architect).

[ ] Contractor's Written Two-Year Warranty And Extended Warranties (If Any Required).

[ ] Manufacturer’s Warranty/Guaranties

[ ] Manifest for Disposal of Hazardous Material.

[ ] Manifest for Disposal of Material.

[ ] Architects Punch List Items, including photographs, certifying all Punch List Items have been completed with sign-off by Construction Manager and Contractor.

[ ] Project Record Documents.

[ ] Approved As-Built Drawings. (Printed Copy and PDF Format with corrections if any)

[ ] **All files listed above shall be submitted on USB flash drive**

_____ Date _____

(Authorized signing officer, Title)

FINAL COMPLETION

[ ] Contractor's Affidavit of Payment of Debts And Claims: AIA G706.

[ ] Contractor's Affidavit of Final Release of Liens - AIA G706a With:

[ ] Separate Written Release of Waivers and Liens for **all** Sub- Contractors, Suppliers And Others With Lien Right Against The Owner's Property, Together With List of Those Parties.

[ ] Notarized Statement That Only Non-Asbestos Materials Were Installed On This Project.

[ ] Consent Of Surety To Final Payment AIA G707.

[ ] Contractor’s Certification of Payment of Prevailing Wage Rates.

[ ] Contractor’s Certification of Compliance that products comply with VOC requirements stated in Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

_____ Date _____

(Authorized signing officer, Title)

Final payment will not be processed until all items indicated are received in accordance with Section 01 7800 - Closeout Submittals, including Releases of Liens from Contractor and all entities of the Contractor.

4.1

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Brewster Central School District personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Items specified in individual product Sections.

C. Training of Brewster Central School District personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.3 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.

B. Training Plan: Brewster Central School District will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Construction Manager for transmittal to Brewster Central School District.
   2. Submit to Commissioning Authority for review and inclusion in overall training plan.
   3. Submit not less than four weeks prior to start of training.
   4. Revise and resubmit until acceptable.
   5. Provide an overall schedule showing all training sessions.
   6. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Brewster Central School District's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.

1.5 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Construction Manager.

B. Demonstration may be combined with Brewster Central School District personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

E. Demonstration and Training Sessions are to be Videotaped and added to Closeout Package.

3.2 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Construction Manager will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Brewster Central School District's personnel to be trained; re-schedule training sessions as required by Brewster Central School District; once schedule has been approved by Brewster Central School District failure to conduct sessions according to schedule will be cause for Brewster Central School District to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 01 9113
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Brewster Central School District are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Brewster Central School District's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

1.2 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Architect; in that case, submit to Architect first.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.
   5. As soon as possible after submittals made to Architect are approved, submit copy of approved submittal to the Commissioning Authority.

B. Product Data: If submittals to Architect do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. Startup, operating, and troubleshooting procedures.
   4. Fan and pump curves.
   5. Factory test reports.
   6. Warranty information, including details of Brewster Central School District's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Completed Prefunctional Checklists.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Brewster Central School District.

B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:

1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F (0.3 degree C) and resolution of plus/minus 0.1 degree F (0.05 degree C).
2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Brewster Central School District; such equipment, tools, and instruments are to become the property of Brewster Central School District.

D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.

1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Brewster Central School District.

PART 3 EXECUTION

3.1 COMMISSIONING PLAN

A. Commissioning Authority will prepare the Commissioning Plan.

1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:

1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.2 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.3 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.
   5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
   6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
   7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
   1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
   2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
   3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
   4. When asked to review the proposed Checklists, do so in a timely manner.

D. Commissioning Authority Witnessing: Required for:

1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Brewster Central School District.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.4 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Brewster Central School District; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Brewster Central School District and Commissioning Authority personnel time witnessing re-testing.
5. Contractor shall bear the cost of Brewster Central School District and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
2. Examples of Functional Testing:
a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.

d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.5 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
2. Verify that sensors with shielded cable are grounded only at one end.
3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F (0.1 degree C) of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches (150 mm) of the site sensor.
2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
2. Connect a signal generator in place of sensor.
3. Connect ammeter in series between transmitter and building automation system control panel.
4. Using manufacturer’s resistance-temperature data, simulate minimum desired temperature.
5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches (150 mm) of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F (0.2 degree C).
4. Relative Humidity: 4 percent of design.

5. Barometric Pressure: 0.1 inch of Hg (340 Pa).
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F (1.1 degrees C).

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.6 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
   a. Major equipment.
   b. Life-safety-critical equipment.
   c. Prefunctional Checklist execution.
3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:

1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
2. Other points will be monitored by the Commissioning Authority using dataloggers.
3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
5. Graphical output is desirable and is required for all output if the system can produce it.
6. Monitoring may be used to augment manual testing.

3.7 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 7800 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Brewster Central School District.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Brewster Central School District.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Concrete formwork.

B. Concrete for composite floor construction.

C. Floors and slabs on grade.

D. Concrete footings.

E. Concrete reinforcement.

F. Fiber reinforcement

G. Joint devices associated with concrete work.

H. Concrete curing.

I. Pits.

J. Fence posts.

K. Concrete toppings.

L. Patching.

M. Finishes.

N. Concrete fill for steel pan stairs.

O. Mix design.

P. Vapor Retarder.

Q. Concrete materials.

R. Placement procedure.

S. Field Quality Control.

1.3 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

B. Section 07 9513 - Expansion Joint Cover Assemblies.

1.4 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

D. ACI 305R - Guide to Hot Weather Concreting; 2010.

E. ACI 308R - Guide to External Curing of Concrete; 2016.

F. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

G. ACI 347R - Guide to Formwork for Concrete; 2014.

H. ACI PRC-223 - Shrinkage-Compensating Concrete - Guide; 2021.

I. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.

J. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

L. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

M. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

N. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.

P. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

Q. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.

R. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

T. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.

U. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.

V. ASTM C845/C845M - Standard Specification for Expansive Hydraulic Cement; 2012.

W. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.

X. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).

Y. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.

Z. ASTM C1582/C1582M - Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete; 2011, with Editorial Revision (2017).

AA. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

AB. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2015.

AC. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).

AD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

AE. COE CRD-C 513 - COE Specifications for Rubber Waterstops; 1974.

AF. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions for each product indicated.

C. Mix Design: Submit proposed concrete mix design with NY State Professional Engineer seal and signature.
   1. Indicate on mix design coversheet where each mix will be used.
   2. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   3. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
   4. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.
   5. Indicate proposed mix design complies with admixture manufacturer's written recommendations.
   6. Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Samples: Submit two, 12 inch (305 mm) long samples of waterstops and construction joint devices.

F. Test Reports: Submit report for each test or series of tests specified.

G. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

H. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Brewster Central School District's name and registered with manufacturer.

J. Product Data: For each type of product indicated.

K. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

L. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
   1. Include foundation plans and elevations.
   2. Indicate all penetrations and sleeve location and reinforcing.
   3. Identify areas of exposed surfaces and finish.

M. Qualification Data: For installer, testing agency, concrete supplier, and lab responsible for design mixes.
.

N. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

O. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Waterstops.
   6. Curing compounds.
   7. Bonding agents.
   8. Adhesives.
   9. Vapor retarders.
   10. Semirigid joint filler.

11. Joint-filler strips.
12. Repair materials.
13. Anti-spalling treatment (see 3.8, E.7).

1.6 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs required to include moisture vapor reducing admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

E. Installer Qualifications: The work of this section shall be performed by a qualified installer, with a minimum of five (5) years experience, approved by the Architect. The term “installer” used herein, shall mean a firm of established reputation which is regularly engaged in and which maintains a regular force of workmen skilled in the installation of the type of work specified in this section.

F. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

G. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

H. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

I. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements.-
   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. Concrete subcontractor.
   2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold and hot weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.

K. Delivery Records: Each delivery to the site of concrete shall be accompanied by weigh master's certification. Retain all copies for inspection by the Architect.
   1. Indicate water added to mix a job site on each delivery ticket. Show quantity of water added. Site water tempered mixes exceeding specified slump range will be rejected as not complying with specification requirements

L. WARRANTY
   1. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
   2. Slabs with Porosity Inhibiting Admixture (PIA) or Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover cost of flooring failures due to moisture migration from slabs for life of the concrete.
      a. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.

b. Provide warranty by admixture manufacturer matching terms of flooring adhesive or primer manufacturer's material defect warranty.

3. Moisture Emission-Reducing Curing and Sealing Compound, Membrane-Forming: Provide warranty to cover cost of flooring delamination failures for 10 years.
   a. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. All packed materials shall be delivered to the site in original unopened containers, clearly indicating manufacturer's name, brand name, and other identifying information.

1.8 PROJECT CONDITIONS

A. Coordinate with the work of all other sections and separate contracts.

PART 2 PRODUCTS

2.1 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Steel.
   2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
   3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.
   5. Composite metal deck.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.
   3. Finish: Galvanized in accordance with ASTM A767/A767M, Class I, unless otherwise indicated.
   4. Finish: Epoxy coated in accordance with ASTM A775/A775M, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): As indicated on the drawings..
   1. Form: Flat Sheets.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type. and Type 1A-Air Entraining Type.

1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, _____.

D. Calcined Pozzolan: ASTM C618,

E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

G. Structural Fiber Reinforcement: ASTM C1116/C1116M.
1. Fiber Type: Alkali-resistant synthetic.
2. Fiber Length: 1.5 inch (38 mm), nominal.
3. Products:
a. GCP Applied Technologies; STRUX 90/40: www.gcpat.com/#sle.
b. SI Concrete Systems; Fibermesh.
c. Axim Concrete Technologies; Fibrasol F.
d. Euclid Chemical Company (The); Fiberstrand F.
e. FORTA Corporation; Forta.
f. Grace Construction Products, W. R. Grace & Co.; Grace Fibers.
g. Substitutions: See Section 01 2500 Substitution Procedures..

2.4 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

G. Accelerating Admixture: ASTM C494/C494M Type C.

H. Retarding Admixture: ASTM C494/C494M Type B.

I. Water Reducing Admixture: ASTM C494/C494M Type A.

J. Shrinkage Reducing Admixture:
1. ASTM C494/C494M, Type S.

K. Shrinkage Compensating Admixture: For on site production of concrete with ASTM C845/C845M, cement.

L. Shrinkage Compensating Admixture with Fiber Reinforcement: For on site production of concrete with ASTM C845/C845M, cement with integral fiber reinforcement.

M. Corrosion Inhibiting Admixture:
1. ASTM C494/C494M, Type C.
2. ASTM C1582/C1582M.

N. Microbiologically-Induced Corrosion Inhibiting Admixture: Resists growth of bacteria and fungi on or inside concrete.

O. Moisture Vapor Reducing Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs). Closes capillary systems formed during concrete curing to reduce moisture vapor emission and transmission. Reduces concrete shrinkage with no adverse effect on concrete properties or applied flooring.

1. Provide admixture in slabs to receive adhesively applied flooring.
2. Products:
   a. Barrier One Concrete Admixtures; MVRA-CPS: www.barrierone.com/#sle.
   b. Hycrete, Inc; V1000: www.hycrete.com/#sle.
   c. Substitutions: See Section 01 6000 - Product Requirements.

P. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
1. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.
2. Permeability of Cured Concrete: No measurable leakage when tested in accordance with COE CRD-C 48 at 200 psi (1.38 MPa); provide test reports.
3. Potable Water Contact Approval: National Science Foundation (NSF) certification for use on structures holding potable water, based on testing in accordance with NSF 61 and NSF 372
4. Products:
   a. Aquafin, Inc; _____: www.aquafin.net/#sle.
   b. ConShield Technologies, Inc; _____: www.conshield.com/#sle.
   c. Substitutions: See Section 01 6000 - Product Requirements.

Q. Waterproofing Admixture System: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties; includes manufacturer-provided field services and performance warranty.
1. Products:

R. Integral Hardening Admixture: Dry powder added to concrete during batching.
1. Products:
   a. Kryton International, Inc; HARD-CEM: www.kryton.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

2.5 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
2. Installation: Comply with ASTM E1643.
3. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
4. Products:
   a. "Griffolyn T-65G" by Reef Industries In, three-ply, nylon- or polyester-cord-reinforced, high-density polyethylene sheet; laminated to a nonwoven geotextile fabric, 30 mils (0.76 mm) thick.
   b. Substitutions: 01 6000 - Product Requirements.

B. Dovetail Anchor: 14 gauge, 1" wide, stainless steel designed for fastening to concrete backup.
1. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1875 inch diameter.
   a. 303-SV Seismic-Notch Dovetail Anchor, Hohmann & Barnard

C. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
   a. Maximum: Plus 4 percent.
   b. Minimum: Plus 1 percent.

3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch (13.7 MPa).
4. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch (48 MPa).
5. Products containing aluminum powder are not permitted.
6. Flowable Products:
   a. Five Star Products, Inc; Five Star Fluid Grout 100: www.fivestarproducts.com/#sle.
   b. Kaufman Products Inc; SureGrout: www.kaufmanproducts.net/#sle.
   c. The QUIKRETE Companies; QUIKRETE® Exterior Use Anchoring Cement: www.quikrete.com/#sle.

D. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.
1. Acceptable Products:
   a. Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
   b. Vocomp-30; W. R. Meadows, Inc

2.6 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
2. Products:
   a. Hilti-Hit RE 500 V3, Epoxy Adhesive Anchoring System

2.7 Waterproofing Admixture Slurry: Slurry coat of Portland cement, sand, and crystalline waterproofing additive, mixed with water in proportions recommended by manufacturer to achieve waterproofing at cold joints in concrete.

A. Waterstops: Rubber, complying with COE CRD-C 513.
1. Configuration: As indicated on drawings.
2. Size: As indicated on drawings.

B. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
1. Size: As indicated on drawings.

C. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness, with removable top section that will form 1/2 inch (13 mm) deep sealant pocket after removal.
1. Material: ASTM D1751, cellulose fiber.
2. Products:
   a. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip: www.wrmeadows.com/#sle.
   b. Substitutions: See Section 01 2500 Substitution Procedures.

D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches (150 mm) on center; ribbed steel stakes for setting.
1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
2. Height: To suit slab thickness.
3. Manufacturers:
   a. Vinylex, Knoxville, TN 37921 (615) 690-2211..
   b. Substitutions: See Section 01 2500 Substitution Procedures..

Moisture-Retaining Sheet: ASTM C171.

A. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch (0.102 mm).

B. Water: Potable, not detrimental to concrete.

2.8 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

C. Concrete Patching and Repair: One-component, early strength gaining, cementitious, patching material.
   1. Flexural Strength (ASTM C-293): 28 days 850 psi.
   2. Splitting Tensile Strength (ASTM C-496): 28 days 550 psi.
   3. Bond Strength (ASTM C-882 modified): 28 days 1,800 psi.
   4. Compressive Strength (ASTM C-109): 28 days 7,000 psi.
   5. Color Concrete gray
   6. Manufacturers:
      a. Acceptable Products: SilkaRepair 223
      b. Substitutions: 01 6000 - Product Requirements.

2.9 CONCRETE MIX DESIGN

A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
   2. Compressive Strength: Not less than 4,000 29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Identify sources of all products used in design mixes.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Fiber Reinforcement: Add to mix as recommended by manufacturer for specific project conditions.

E. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
   2. Water-Cement Ratio: Maximum 0.45 .
   3. Total Air Content for concrete exposed to weather: 6 percent, determined in accordance with ASTM C173/C173M.
   4. Maximum Slump: 4 inches (100 mm).
   5. Maximum Aggregate Size: 3/4 inch (19 mm).

2.10 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

1. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.
2. Expansive Component: Batch and mix as recommended by manufacturer for specific project conditions.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

D. Do not use expansive component in same concrete batch with MVRA or PIA.

E. Do not use shrinkage-reducing admixture (SRA) in same concrete batch with MVRA or PIA.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. For metal deck forms see Section 05 3100.

D. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

E. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R.

F. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
2. Use latex bonding agent only for non-load-bearing applications.

G. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

H. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout. Provide epoxy as mfg. by Hilti, HIT 500 V3 and in strict accordance with manufacturers instructions.

I. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade, where noted on drawings. Comply with ASTM E1643. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

B. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

D. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.4 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI PRC-302.1.

C. Place concrete with shrinkage-compensating expansive component in accordance with ACI PRC-223.

D. Notify Architect not less than 24 hours prior to commencement of placement operations.

E. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

F. Ensure reinforcement, waterstops, and formed construction joint devices will not be disturbed during concrete placement.

G. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

H. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.5 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Hand tooled or Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool after placing; cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab or as indicated on drawings.

3.6 Separate Floor Toppings

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

B. Apply bonding agent to substrate in accordance with manufacturer's instructions.

C. Place concrete floor toppings to required lines and levels.

1. Place topping in checkerboard panels not to exceed 20 feet (6 m) in either direction.

D. Screed toppings level, maintaining surface flatness of maximum 1:1000.

3.7 Floor Flatness and Levelness Tolerances

A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for compliance with specified tolerances.

B. Maximum Variation of Surface Flatness:

1. Exposed Concrete Floors: 1/4 inch (6 mm) in 10 feet (3 m).
2. Under Seamless Resilient Flooring: 1/4 inch (6 mm) in 10 feet (3 m).
3. Under Carpeting: 1/4 inch (6 mm) in 10 feet (3 m).

C. Correct the slab surface if tolerances are less than specified.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Equipment Bases and Foundations: Provide machine, locker and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.9 DEFLECTIONS FOR ALL METAL DECK/CONCRETE WORK:

A. It shall be the Contractor's responsibility and choice as to how the proper elevations or grades are to be accomplished at the top of the slab. Where concrete is poured over metal deck and steel framing it must be assumed that the composite deck, beams, and girders will deflect as the wet concrete is placed unless shored. The contractor shall provide shoring or additional concrete, or both to bring the slab up to the proper grade at no additional cost to the Owner. Monitor top of slab elevation continuously during pour from a fixed position to assure flatness criteria are met.

3.10 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch (6 mm) or more in height. Provide finish as follows:

1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

E. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
3. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
    a. Revise locations of scratch finish in subparagraph below to suit Project.
    b. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.
4. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture

5. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
   a. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
6. Broom Finish: Apply a broom finish to exterior sidewalks, concrete platforms, steps, and ramps, and elsewhere as indicated.
   a. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
7. Anti-Spalling Treatment: Apply compound to exterior concrete surfaces no sooner than 28 days after placement. Apply to clean, dry concrete, free of oil, dirt and other foreign materials, in 2-sprayed applications. First application at rate of 40 square yards per gall; second application, 60 square yards per gal. Allow complete drying between applications
8. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.11 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.
      a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.12 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards (76 cu m) or less of each class of concrete placed.

E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

G. Slab Testing: Cooperate with manufacturer of specified moisture vapor reducing admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.13 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.14 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03 5400
CAST UNDERLAYMENT

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 SECTION INCLUDES

1.3 RELATED REQUIREMENTS

A. Section 01 7000 - Execution: Alteration project procedures; selective demolition for remodeling.

B. Section 03300 - Cast in Place Concrete for concrete construction and finish.

C. Section 09650 - Resilient Flooring for flashing patching.

1.4 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

C. ASTM C 580 Flexural Strength

D. ASTM D 3931 Bond Strength (concrete).

E. ASTM F-2170 Relative Humidity in Concrete

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

C. Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Instructions.

E. Material Test Reports: From a qualified testing agency indicating and interpreting test results of underlayments for compliance with requirements indicated.

F. Minutes of preinstallation conference.

G. Submit certification, in writing, by the finish floor manufacturer, that the cast underlayment is compatible and acceptable for their product.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years of experience who has completed work similar in material, design, and extent to that indicated for this Project.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented ac-cording to ASTM E 548.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section 01300 Administrative Requirements

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F (41 degrees C).

1.8 REGULATORY REQUIREMENTS

A. Conform to New York State Building Codes for combustibility or flame spread requirements.

1.9 MOCK-UP

A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Prepare mock-up in location designated by Architect.
   2. Area: 6 ft by 6 ft (2 m by 2 m).
   3. Do not proceed with underlayment work until workmanship of mock-up has been approved by Architect
   4. If Architect determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed.
   7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Mock-up may remain as part of the Work.

1.10 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting underlayments performance.

C. Maintain minimum ambient temperatures of 50 degrees F (10 degrees C) 24 hours before, during and 72 hours after installation of underlayment.

D. During the curing process, ventilate spaces to remove excess moisture.

E. Close areas to traffic during underlayments application and, after application, for time period recommended in writing by manufacturer

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cementitious Underlayment:
   1. ARDEX Engineered Cements; ARDEX K 15: www.ardexamericas.com.
      a. Locations where finish flooring is specified.
   2. ARDEX Engineered Cements; ARDEX SD-T: www.ardexamericas.com.
      a. Locations where painted finish flooring is specified.
   3. Substitutions: 01 6000 - Product Requirements.

2.2 MATERIALS

A. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 5500 pounds per square inch (- MPa) after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1250 psi (8.6 MPa) after 28 days, tested per ASTM C348.
   3. Bond Strength: 350-400 psi when tested in conformance with ASTM D 3931
   4. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch (89 mm).
   5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

B. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch (3 mm) in size and acceptable to underlayment manufacturer.

C. Reinforcement: Galvanized metal lath complying with recommendations of underlayment manufacturer for specific project circumstances.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

E. Primer: Manufacturer's recommended type.

F. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240

G. Acrylic-Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.3 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch (12.7 mm). Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.

B. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically profile 100% of base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch

1. After profiling test substrate by place drop of water, or other means to insure all coatings, sealers etc have been removed. Repeat profiling if necessary.
2. Prepare and clean existing base slabs according to topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
3. Mechanically remove contaminants from existing concrete that might impair bond of topping.
4. Saw cut existing contraction and construction joints to a depth of 1/2 inch and fill with epoxy joint filler.

C. Install joint-filler strips where topping abuts 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 topping surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips 1/2 inch below topping surface where joint sealants, specified in Division 7 Section "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.

D. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

E. Vacuum clean surfaces.

F. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

G. Close former roof and floor openings where items and equipment have been removed and as indicated..

3.3 APPLICATION

A. Start topping application in presence of manufacturer's technical representative.

B. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place topping while adhesive is still tacky

C. Install underlayment in accordance with manufacturer's instructions.

D. Pump or pour material onto substrate. Do not retemper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks.

E. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft (1:1000).

F. For final thickness over 1-1/2 inches (38 mm), place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.

G. Place before partition installation.

H. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

I. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of topping, at locations indicated or as approved by Architect.
   1. Coat face of construction joint with epoxy adhesive at locations where topping is placed against hardened or partially hardened topping.

J. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before topping develops random contraction cracks.
   1. Form joints in topping over contraction joints in base slabs, unless otherwise indicated.
   2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.
   3. Construct contraction joints for a depth equal to one-half of topping thickness, but not less than 1/2 inch deep

K. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.4 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

C. Begin curing immediately after finishing topping. Cure by one or a combination of the following methods, according to topping manufacturer's written instructions:
   1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.5 JOINT FILLING

A. Prepare and clean contraction joints and install epoxy joint filler, according to manufacturer's written instructions, once topping has fully cured.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install epoxy joint filler full depth of contraction joints. Overfill joint and trim joint filler flush with top of joint after hardening

3.6 FIELD QUALITY CONTROL

A. Placed Material: Agency will inspect and test for compliance with specification requirements.

3.7 REPAIRS

A. Defective Topping: Repair and patch defective topping areas, including areas that have not bonded to concrete substrate

3.8 PROTECTION

A. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Reinforced concrete unit masonry
B. Concrete Masonry Unit (CMU)
C. Polished Ground Face (CMU)
D. Special shapes
E. Concrete Brick.
F. Clay Facing Brick.
G. Mortar and Grout.
H. Reinforcement and Anchorage.
I. Cavity Wall Insulation
J. Flashings.
K. Lintels.
L. Masonry Accessories.
M. Parging

1.3 RELATED REQUIREMENTS

A. Section 04 7200 - Cast Stone.
B. Section 05 5400 - Cold Formed Metal Framing
C. Section 05 5000 - Metal Fabrications: Loose steel lintels.
D. Section 07 2500 - Weather Barriers
E. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
F. Section 09 2662 - Gypsum Sheathing.
G. Section 09 9100 - Louvers: (Set in masonry).

1.4 MATERIAL EVALUATION/ QUALITY ASSURANCE

A. Preconstruction Testing: Contractor shall employ and pay qualified independent Testing Agency to perform preconstruction testing indicated and other inspecting and testing services required for source and field quality control.
   1. Clay Unit Masonry Tests: For each different clay masonry unit indicated, test units in accordance with ASTM C 67.
   2. Concrete Masonry Unit Tests: For each different concrete masonry unit indicated, test units for strength, absorption, and moisture content in accordance with ASTM C 140.
   3. Prism Tests: For each type of wall construction indicated, test masonry prisms in accordance with ASTM C 1314.
      a. Contractor shall fabricate prisms under supervision and direction of Testing Agency Representative.
   4. Test mortar composition and properties in accordance with ASTM C 270 if Property Specification is used.

5. Evaluate mortar proportions in accordance with ASTM C 270 if Proportion Specification is used.
6. Test mortar properties for approved mix in accordance with ASTM C780 (Compressive Strength Method) to determine a base line for field mortar tests.
7. Test grout compressive strength in accordance with ASTM C 1019 to demonstrate compliance with ASTM C476, Property Specification.
   a. Contractor shall deliver to Testing Agency accepted CMU for fabrication of test samples.
8. Test self-consolidating grout compressive strength in accordance with ASTM C1019. Test slump flow and visual stability index in accordance with ASTM C1611/C1611M.

B. Testing Agency Qualifications: Independent Testing Agency shall demonstrate to Architect's satisfaction that it has experience and capability to satisfactorily perform testing indicated without delaying progress of work.

C. Contractor shall employ and pay a licensed Land Surveyor to survey foundations for compliance with dimensional tolerances specified in referenced unit masonry standard.

D. Preinstallation Conference: Perform conference at project site to comply with requirements of Division 1 section "Project Meetings."

1.5 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2015.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

F. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012.

G. ASTM C55 - Standard Specification for Concrete Building Brick; 2011.

H. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2013.

I. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2014.

J. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

K. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.

L. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.

M. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

N. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

O. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

P. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.

Q. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

R. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2011b.

S. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

T. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength; 2013.

U. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2008).

V. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2014.

W. ASTM C1634 - Standard Specification for Concrete Facing Brick; 2011.

X. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2014.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Reference Contract Drawing number and addendum number in each shop drawing.

C. Submit detailed drawings for stone trim in form of cutting and setting drawings showing sizes, profiles, locations, and anchorages of each stone trim unit required.

D. Shop drawings:
1. Reference Contract Drawing number and addendum number in each shop drawing.
2. Submit detailed drawings for stone trim in form of cutting and setting drawings showing sizes, profiles, locations, and anchorages of each stone trim unit required.
3. Submit shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement. Show elevations of reinforcement in wall at 1/4"=1'-0" scale

E. Product Data: Submit manufacturer's product data for each different masonry unit, accessory, and other manufactured product indicated including data for masonry units, fabricated wire reinforcement, mortar, grout, masonry accessories, and brick anchors.

F. Samples: Submit four samples of Brick and ground face units to illustrate color, texture, and extremes of color range.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Brick Units: 100 of each type, size, and color combination.

H. Material Data: Submit to Special Inspector and Architect/Engineer certificates for the following signed by manufacturer and Contractor certifying each material complies with requirements.
1. Masonry Units.
2. Each different cement product required for mortar and grout, including name of manufacturer, brand, and type.
3. Integral water repellant used in mortar.
4. Each material and grade indicated for reinforcing bars.
5. Each type and size of joint reinforcement.
6. Each type and size of anchors, ties, and metal accessories.

I. Material Test Reports: Submit to Special Inspector and Architect/Engineer reports from qualified independent Testing Agency employed and paid by Contractor indicating and interpreting test results relative to compliance for the following proposed masonry materials with requirements indicated:
1. Mortar: Property (Proportion) requirements of ASTM C 270.
2. Grout complying with ASTM C 476. Include description of type and proportions of grout ingredients.
3. Masonry units: ASTM C67 and ASTM C140.

4. Field Mortar Base Line Compressive Test: ASTM C780.
5. Efflorescence tests for Brick: ASTM C67.
6. Durability tests for surface-coated brick: ASTM C67.
7. Construction Procedures: Submit cold-weather construction and hot-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.
8. Qualification Data: Submit data for firms and persons specified to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, telephone numbers, names of Architects and Owners, and other information specified.
9. Grouting Program: Submit proposed grouting program for grouting CMU walls. Grouting shall be in accordance with recommendations of NCMA-TEK 3-2A. Provide grout demonstration panel when proposed grouting techniques do not meet NCMA recommendations.

1.8 QUALITY ASSURANCE

A. The Registered Design Professionals (RDPs) for Structural Engineering and Architecture will visit construction site at appropriate intervals to determine if work is in general conformance with Contract Documents and specifications. Notify RDPs 48 hours before anticipated time of completion for given section of work so they may determine if site observations are required. If site observations are required, do not place grout or continue construction of masonry until RDPs have had opportunity to make observations.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five (5) years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

D. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

1.9 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 10 feet (2.4 m 3.3m) long by 6 10 feet (1.8 m 3.3m) high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Locate where directed.

C. Mock-up may not remain as part of the Work.

D. Build mockup of typical wall area as directed by Architect.

E. Build mockups for the following types of masonry in sizes listed. approximately 96 inches long by 72 inches high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
   1. Each type of exposed unit masonry construction including pre-cast units Typical interior and exterior unit masonry wall, where exposed.
   2. Typical exterior wall with lower corner of window opening framed with stone trim at upper corner of mockup. Make opening approximately 36 inches wide by 36 inches high. Show jamb construction, special coursing and bands.

F. Typical exterior wall with through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).

G. Typical steel stud framing or masonry backup.
   1. Clean exposed faces of mockups with masonry cleaner as indicated.
   2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.

3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
7. Demolish and remove mockups when directed

H. Grout Demonstration Panel: If proposed grouting procedures, construction techniques, or grout space limitations do not conform to the requirements of this Specification, a grout demonstration panel is required to be constructed prior to installation of Contract work. Grout demonstration panel must represent actual project and field conditions. After grouting, the panel must be deconstructed to confirm whether filling and adequate consolidation has been achieved. The RDP will determine whether the proposed grouting procedures are acceptable for use for Contract work.

I. The Registered Design Professionals (RDPs) for Structural Engineering and Architecture will visit construction site at appropriate intervals to determine if work is in general conformance with Contract Documents and specifications. Notify RDPs 48 hours before anticipated time of completion for given section of work so they may determine if site observations are required. If site observations are required, do not place grout or continue construction of masonry until RDPs have had opportunity to make observations

1.10 SPECIAL INSPECTIONS

A. Refer to Specification Section 01 4533 and Schedule of Special Inspections.

1.11 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
   2. Where one wythe of multi wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to un constructed wythe and hold cover in place.
   3. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
   4. 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.
      a. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
      b. Protect sills, ledges, and projections from mortar droppings.
      c. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
      d. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
   5. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 IMIAC and the following:

a. When the ambient temperature is within the limits indicated, use the following procedures:
   a) 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).
   b) 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
   c) 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.
   d) 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosures.
   e) Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
      (a) 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
      (b) 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h (25 km/h).
      (c) 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.
   f) Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

6. 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.
   a. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.
   b. Verify moister content in brick. If dry wet bricks prior to installation.
      a) Comply with the requirements of IMIAC.
7. Under no circumstances shall masonry installation cease or be delayed due to the weather conditions. Installation shall continue using procedures listed above.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Handle and store pre-faced concrete block units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

C. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

1. Protect concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

F. Deliver pre blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

G. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.13 WORKMANSHIP

A. Contractor shall be responsible for correction of work not conforming to specified requirements. Correct deficient work as directed by Architect.

B. Remove work found to be defective. Replace with new acceptable work

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Masonry General
1. Unit Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 “Specifications for Masonry Structures” except where exceeded by the requirements of the contract documents.
2. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined in accordance with ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means as acceptable to authorities having jurisdiction.
3. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color or uniform blend within ranges accepted for these characteristics from one manufacturer for each different product required for each continuous surface or visually related surfaces.
4. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

B. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on the drawings for specific locations.
a. Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated in drawings. If not shown in drawings, use length to produce coursing with little or no cutting.
2. Special Shapes: Provide non-standard blocks configured for corners, lintels, “U” block and control joint edges. All corner CMU's shall be pre-formed radiused corners for the full height of the wall.
a. For lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
3. Load-Bearing Units: ASTM C90, normal weight.
4. Unit compressive strength, 2,500 psi, minimum average net area.
5. Non-Loadbearing Units: ASTM C129.
a. Normal weight.
b. Unit compressive strength, 2,500 psi, minimum average net area
c. Exposed Faces: Special color and texture, See the drawings.
6. Use two cell units for reinforced masonry applications.

C. Ground Face Polished Masonry Units
   1. Concrete blocks for grinding shall conform to:
      a. ASTM C90.Grind to expose the variegated colors of the aggregates.
      b. ASTM C1262 - Freeze / Thaw
      c. ASTM c744 - Adhesion / Abrasion / Color
      d. Manufacturer grout filled pores and polished smooth.
      e. Manufacturer heat-treated acrylic or water-based sealer finish.
      f. Manufactured with integral water repellant.
      g. Manufactured special shapes. Radiused corners.
      h. Colors: As indicated on the drawings.
   2. Manufacturer: (Basis of Design)
      a. Echelon, an Old Casle Company. 3 Glendale Pkwy. Atlanta, Ga. 30328 www.eschelonmasonry.com
      b. Product:
         a) Trendstone Plus.

D. Concrete Building Brick:
   1. For below grade use, ASTM C1634 , normal weight.
   2. For other uses, ASTM C55, normal weight.
   3. Unit compressive strength, 3,500 psi, minimum average net area.
   4. Size:
      a. Standard Modular: 3 5/8 inches wide by 2 1/4 inches high by 7 5/8 inches long.
      b. Oversize: 3 5/8 inches wide by 2 3/4 inches high by 7 5/8 inches long.
   5. Economy: 3 5/8 inches wide by 3 5/8 inches high by 7 5/8 inches long.

2.2 BRICK UNITS

A. Manufacturers:
   1. **Field Brick :** “Dark Pewter Grain". The Lakewood Brick Company, 1325 Jay Street, Lakewood, CO 80214. Distributed by CASA Building Materials. 914 789-4000
   2. **Accent Brick** : “Cream", modular, wire cut. Taylor Clay Products. P.O. Box 21218, Salisbury, NC 28145 704 6362411. Distributed by CASA Building Materials. 914 789-4000
   3. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
      a. Color and texture to match Architect's sample.
      b. Use where brick is exposed.
      c. Actual size: Standard Modular: 3 5/8" thick x 2 1/4" high x 7 5/8" long.
      d. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
      e. Compressive strength: 3,000, measured in accordance with ASTM C67.
      f. Initial Rate of Absorption: Less than 15 g/30 sq. in. per minute when tested per ASTM C 67.
      g. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
      h. Surface Coloring: Brick with surface coloring, other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I; color as required to produce approved color sample.
   1. Not more than 0.1 percent alkali.
   2. Hydrated Lime: ASTM C207, Type S.

3. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
4. Masonry Cement: Not Permitted.
5. Mortar Cement: ASTM C 1329/C 1329M.
6. Ready Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this article, combined with set controlling admixtures to produce a ready mixed mortar complying with ASTM C 1142.
7. Mortar Aggregate: ASTM C144. For joints less than ¼ inch, use aggregate graded with 100 percent passing No. 16 sieve.
   a. White Mortar Aggregates: Natural white Pigment for Colored sand or ground white stone.
   b. Colored Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
8. Grout Aggregate: ASTM C404.
9. Water: Clean and potable.
10. Integral water repellant.
11. Additives not permitted unless approved by Architect.

B. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M <http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20C979/C979M>.
   1. Color(s): As selected by Fuller and D'Angelo P.C. from manufacturer's full range.
   2. Manufacturers:
      a. Solomon Colors; Solomon Colors Concentrated A, H, and X Series: www.solomoncolors.com/#sle.

C. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
   1. Acceptable product: Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division, Mortar Tite; Addiment Inc, Rheopel; Master Builders.
   2. Substitutions: See Section 01 2500 Substitution Procedures..

D. Cold-Weather Admixture:
   1. Accelguard 80; Euclid Chemical Co.
   2. Morseled; W. R. Grace & Co., Construction Products Division.
   3. Trimix-NCA; Sonneborn, Div. of ChemRex, Inc

2.4 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com. <http://www.h-b.com/>

B. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.

C. Recycled Content: Provide minimum 90 percent postconsumer recycled content. For stainless steel products, provide minimum 60 percent postconsumer recycled content.

D. Steel Reinforcing Bars: Material and grade as follows:
   1. Billet steel complying with ASTM A 615.
   2. Epoxy-coated billet steel complying with ASTM A 615 and ASTM A 775.
   3. Grade 60.

E. Deformed Reinforcing Wire: ASTM A 496.

F. Plain-Welded Wire Fabric: ASTM A 185.

2.5 JOINT REINFORCEMENT

A. General: ASTM A951. Provide joint reinforcement complying with requirements of referenced unit masonry standard and this article, formed from the following:
   1. Galvanized carbon steel wire, Coating Class as required by referenced unit masonry standard application indicated.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units and complying with requirements indicated below:
   1. Wire Diameter for Side Rods: 3/16" inch
   2. Wire Diameter for Cross Rods: 0.1483 inch (9 gauge).

C. Single Wythe Masonry Joint Reinforcement: Ladder type; conforming to ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3. 0.148 inch (3.8 mm) side rods with 0.148 inch (3.8 mm) cross rods; width as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage on each exposure. Flush weld all keys.
   1. Design with perpendicular cross rods spaced not more than 16 inches on center with one side rod in each face shell.
   2. Hohmann & Barnard - #220 extra- heavy. Width dependent on application

D. Adjustable Multiple Wythe Masonry Joint Reinforcement: Ladder type; fabricated with moisture drip; stainless steel wire conforming to ASTM A82/A82M steel wire, hot dip galvanized after fabrication to ASTM A153/153M, Class B; 0.1875 inch (4.8 mm) side rods with 0.1875 inch (4.8 mm) side rods with 0.148 inch (3.8 mm) cross rods; width as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage on each exposure. Flush weld all keys.
   1. Where bed joints align, provide ladder design with perpendicular cross rods spaced not more than 16 inches on center and number of side rods as follows:
      a. One side rod for each face shell of hollow masonry units more than 4 inches in nominal width, plus one side rod for each wythe of masonry 4 inches or less in nominal width.
      b. Where bed joints do not align, or where there is a combination of CMU and clay masonry wythes, provide either type as follows:
         a) Design with perpendicular cross rods spaced not more than 16 inches on center with one side rod in each face shell of CMU wythes. Provide adjustable two-piece rectangular bent wire ties to connect wythes.
         b) Tab-type ladder design with perpendicular cross rods spaced not more than 16 inches on center with one side rod in each face shell with integral, welded eyelet tabs spaced 16 inches on center to accept double pintle leg rectangular wire ties.
   2. Hohmann & Barnard.“#270 Ladder LOX-ALL Adjustable Eye-Wire”.

E. Adjustable Masonry Veneer Anchors for Connecting To Light Gage Metal backup walls.
   1. General: Provide two piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall but resisting tension and compression forces perpendicular to it for attachment over insulation and sheathing to metal studs and with the following structural performance characteristics.
      a. Structural Performance Characteristics: Capable of withstanding a 100-pound load in either tension or compression without deforming over or developing play in excess of 1/16 inch.
      b. Maximum clearance between connecting parts of tie shall be 1/16 inch, consisting of wire tie section and one piece triangular wire ties compatible with anchor section.
   2. Anchor Section: Rib-stiffened, sheet metal plate with rib-stiffened, pronged leg construction to bridge wallboard and insulation and bear on metal studs, with screw holes top and bottom, 0.0747 inch (14 gauge) x 1 1/4 inch x 6, fabricated with raised stiffened strap to provide a slot for wire ties.

a. Stainless-Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless-steel shank.

3. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

4.

a. Hohmann & Barnard HB-213-HS with Mighty Link Lock. Leg depth as required to suit applications. 12 ga. backplate.

b. Provide Hohmann & Barnard continuous TeXtro-Seal Tape, 40 mil thick dual membrane multi-ply polyurethane/polymer modified asphalt.

2.6 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standard and of this article.

B. Galvanized Carbon Steel Wire: ASTM A 82, coating class as required by referenced unit masonry standard for application indicated, for wire ties and anchors in exterior walls.

1. Wire Diameter: 0.1875 inch or as indicated per specific product specification..
2. Mill Galvanized: Class 1 coating.
3. Hot-Dip Galvanized: Class B-2 coating.

C. Steel Sheet: ASTM A1008.

D. Galvanized Heavy-Thickness Steel Sheet: ASTM A 653, G60 (commercial quality) hot-rolled carbon steel sheet hot-dip galvanized after fabrication to comply with ASTM A 525, Class B3, fabricated from steel sheet or strip with a thickness of 0.180 inch and greater, for rigid anchors.

E. Steel Plates and Bars: ASTM A 36, hot-dip galvanized to comply with ASTM A 123 or ASTM A 153, Class B3, as applicable to size and form indicated.

F. Bent Wire Ties

1. General:

a. Ties and anchors shall extend at least halfway into veneer or facing wythe but in no case shall extend less than 1-1/2 inches into veneer, and shall have at least a 5/8-inch cover on outside face.

b. Adjustable ties shall have a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches.

2. Individual two-piece, rectangular bent wire ties: Composed of rectangular closed end unit with eyes, not less than 4 inches wide, and adjustable, double-pintle, rectangular wire ties.
3. One piece, rectangular, double-pintle wire ties: For use with tab-type joint reinforcing.
4. One piece, triangular, dovetail wire tie: With 14-gauge dovetail end for use with dovetail slots.
5. One piece, triangular wire ties: For use with anchors to structural steel and light-gauge framing.

G. Adjustable Anchors For Connecting Masonry To Steel Or Concrete Framework

1. General: Two-piece assemblies as described below allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall but resisting tension and compression forces perpendicular to it.
2. For anchorage to concrete, provide 22-gauge dovetail anchor section formed from galvanized steel sheet, foam filled, and one piece, triangular, dovetail wire-ties.
3. For anchorage to steel framework, provide manufacturer's standard anchors with crimped 3/8 x 8"-inch-diameter, wire anchor section for welding to steel and one piece, wire-ties compatible with anchor.

a. #359 Weld-On Tie" and "#302W Column Web Tie", by Hohmann & Barnard. Use #359 FP-C Weld-On Ties if columns are fireproofed. Stainless steel tie and anchors.

H. Rigid Anchors
1. Provide straps of form and length indicated in drawings, fabricated from galvanized, heavy thickness hot dipped galvanized sheet, 2 inches wide by 1/8 inch thick with 1 1/ 2-inch bends. Zinc Alloy 710.
2. Where rigid anchors are used to bond intersecting walls, strap shall be 24 inches long, plus 2-inch bends at each end.
a. Breakaway Tie - Use Notched Column Anchor, Heckman #189-L or - R as required, where indicated.

I. Wall Ties: Corrugated formed sheet metal, 7/8 inch (22 mm) wide by 0.05 inch (1.22 mm) thick, stainless steel, sized to provide not more than 1 inch (25 mm) and not less than 1 inch (25 mm) of mortar coverage from masonry face.

J. Corrugated Buck Anchor: Corrugated formed sheet metal, 1-1/4-inch-wide, 4" long, by 0.06 inch thick (16 gauge) , hot dip galvanized to ASTM A153/A153M, Class B, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face

K. Dovetail Anchor: 18 gauge, 1" wide, stainless steel designed for fastening to concrete backup.
1. # 315 Dovetail Anchor, Hohmann & Barnard
2. Temporarily fill or cover face of opening of slots to prevent intrusion of concrete or debris.

L. Miscellaneous Anchors
1. Unit-Type Masonry Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
2. Anchor Bolts: Headed bolts complying with A 307, Grade A, with ASTM A 563 hex nuts and flat washers where indicated. Hot-dip galvanized to comply with ASTM A 153, Class C, of diameter and length indicated.
3. Joint Stabilizing Anchor: Acceptable products include the following:
a. "Slip-Set Stabilizer" by Hohmann & Barnard, Inc.
b. "353 Debonded Shear Anchor" by Heckmann Building Products, Inc.
c. "Control Joint Anchor 1700" by Wire-Bond.
4. Cast Stone Anchors: Refer to Section 04-7200 Cast Stone Masonry.

M. Post-Installed Anchors
1. Chemical Adhesive Anchors:
a. Anchors to solid concrete, grouted CMU, solid brick, or stone:
a) Anchors for use when base material temperature is 0°F or greater: "HIT-Ice" by Hilti; "Epcon A7" by ITW Ramset/Red Head; "AC 100 Plus" by Powers Fasteners; "AT Acrylic-Tie" by Simpson/Strong-Tie; or accepted equivalent.
b) Anchors for use when base material temperature is 40°F or greater; "HIT-HY 200 Safe Set" by Hilti; "Epcon C6" by ITW Ramset/Red Head; "T308 Plus" by Powers Fasteners; "ET Epoxy-Tie" by Simpson/Strong-Tie; or accepted equivalent.
b. Anchors to hollow masonry (brick or hollow CMU):
a) Anchors for use when base material temperature is 0°F or greater: "Epcon A7" by ITW Ramset/Red Head; "AC 100 Plus" by Powers Fasteners; "AT Acrylic-Tie" by Simpson/Strong-Tie; or accepted equivalent.
b) Anchors for use when base material temperature is 40°F or greater: "Epcon C6" by ITW Ramset/Red Head; "T308 Plus" by Powers Fasteners; "ET Epoxy-Tie" by Simpson/Strong-Tie; "HIT-HY 70" by Hilti; or accepted equivalent.
c. Provide manufacturer's standard screen tubes for use with anchors

2.7 FLASHINGS

A. Thru-wall Flashing ; Use where flashing is fully concealed in masonry.
   1. Self adhered composite membrane flashing: Polyethylene film laminated to 7oz. copper sheet.
   2. Provide adhesives, preformed shapes for outside, inside and end dams. as recommended by the manufacturer.
   3. Verify sealants specified in Section 07 9200 - Joint Sealants are compatible with flashing.
   4.
   5. Manufacturers:
      a. Flashing
         a) Hohmann & Barnard, Copper SA, Asphalt free self adhering copper fabric flashing.
         b) Color as indicated by Mfg. based on thickness. (7 oz.= Beige)
      b. Termination Bar: Use at top of all flashings.
         a) Hohmann & Barnard T2-FTS Termination bar. Stainless steel, 26 ga. w/ 3/8" flange. and foam tite seal.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

C. Drip Edge: For use with membrane flashing at lintels.
   1. 3/8-inch, exposed hemmed edge by 3 1/2-inch, stainless steel drip edge w/ adhesive tape above and foam tite seal below. Select product compatible with flashing.
   2. Subject to compliance with requirements, products that may be incorporated in work include the following:
      a. DP" by Hohmann & Barnard, Inc. Drip Plate DP-FTS
      b. "Drip Edge" by Johnson Bros.
      c. Drip edge must be adhered to flashing with manufacturer's approved adhesive.
      d. Isolate drip edge from metals other than stainless steel to avoid contact with drip edge.
   3. Drip Edge: For use at Base of wall conditions:
      a. Hohmann & Barnard, FDP, Flat drip plate, flush end. Stainless steel, 26 ga., 3 1/2" W.

D. Preformed Flashing:
   1. Inside corners, outside corners, end dams, and jambs are to be pre-formed and compatible with flashing and drip edge.

E. Tin Coated Copper Flashing: ASTM B370, 060 soft annealed; 16 oz/sq. ft. (.0216" mm) thick; natural finish.

F. Prefabricated Metal Flashing: Smooth fabricated 16 oz/sq. ft. (4.88 kg/sq m) tin coated copper flashing for surface mounted conditions.

2.8 ACCESSORIES

A. Rebar Positioners: Steel wire positioners that are seated into the cores of masonry units.
   1. Wire Diameter: 0.1483 inch (9 gauge).
   2. Mill galvanized finish for interior walls.
   3. Hot-dip galvanized finish for exterior walls.
   4. Acceptable products:
      a. "Corelock" by Wire-Bond.
      b. "RB Rebar Positioner" by Hohmann & Barnard.
      c. "No. 376 Rebar Positioner" by Heckmann Building Products.
      d. Other products that are accepted as equivalent.
   5. Nonmetallic Expansion Joint Strips: Premolded filler strips complying with ASTM D 1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to

petroleum base oils), Grade 1 (compression-deflection range of 2-5 psi), compressible up to 35 percent, of width and thickness indicated, formulated from neoprene.

6. Preformed Control Joint Gaskets: Solid rubber strips with a Shore A durometer hardness of 60 to 80, designed to fit standard sash block and to maintain lateral stability in masonry wall. Size and configuration as indicated or as required.
   a. Styrene-Butadiene Rubber Compound: ASTM D 2000, Designation M2AA-805.
7. Bond Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No.
   a. 15 asphalt felt).
8. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.
9. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   a. Manufacturers:
      a) Hohmann & Barnard, Inc ; RS Series : www.h-b.com/sle. <http://www.h-b.com/sle>
10. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self-expanding; 1/2 inch (- mm) wide by maximum lengths available.
11. Nailing Strips: Softwood lumber, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
12. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.
13. Cavity Vents / Weeps:
   a. Type: Molded PVC grilles, insect resistant.
   b. Manufacturer:
      a) Hohmann & Barnard, Inc: QV - Quadro Vent,
         (a) Location in brick joints at lintels, wall bases and where indicated.
14. Cavity Wall Insulation:
   a. Extruded-Polystyrene Board Insulation: Rigid, cellular, polystyrene thermal insulation with closed cells and integral high-density skin; formed by the expansion of polystyrene base resin with a carbon-black filler in an extrusion process to comply with the following characteristics:
      a) Aged thermal resistance (R-value) for 1-inch thickness of 5.0, deg F x h x sq. ft./Btu at 75 deg F at 5 years.
      b) Compressive strength: 25 as per ASTM D-1621.
      c) Flexural Strength: 75 as per ASTM C-203.
      d) Water Absorption: 0.10 as per ASTM C-272.
      e) Water Vapor Permeance: 0.6 as per ASTM E-96.
      f) Water affinity: Hydrophobic.
      g) Water Capillarity: None. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:
         (a) Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.
            (1) Dimensional Stability: 2.0 as per ASTM D-2126
            (2) Linear Coefficient of thermal expansion: 2.7 x 105.
            (3) Flame Spread: 5 as per ASTM E-84.
            (4) Smoke Developed: 45-175 as per ASTM E-84.
            (5) Oxygen Index: 24 Min. as per ASTM D-2863.
      h) Products: [Owens Corning “High Performance Foamular 250”] 2”x 48”x 96”, T&G, R-10 for metal stud backup application. and 2”x 16”x 96” R-10 for masonry backup application.

15. Cavity Insulation Joint Sealing Tape: Rubber asphalt membrane. 40 mil thick, consisting of 36 mil self-adhering rubberized asphalt membrane laminated to a 4 mil high density polyethylene film and removable release sheet.
    a. Minimum width: 4”
        a) Primer: As recommended by the manufacturer for application over extruded polystyrene insulation.
16. Mortar Collection Systems: HDPE woven mesh, 90% open.
    a. Hohmann & Barnard, Inc; Mortar Trap, 1 1/2 T x 10" HT.
17. Epoxy Adhesive: Fiber Glast 1101.
    a. MSG Hohmann & Barnard, Inc.

2.9 LINTELS

A. Bond beam Lintels: U shape Type size as indicated on the drawings.
    1. Product: Cast-Crete U lintels, pre-cast.

2.10 MASONRY CLEANERS

A. Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
    1. Products:
        a. Cleaners for Red and light-colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:
            a) ProSoCo, Inc. Sure Klean No. 600 Detergent

2.11 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
    1. Do not use calcium chloride in mortar or grout.
    2. Field addition of admixtures is prohibited for self-consolidating grout.

B. Mortar for Unit Masonry: Comply with ASTM C 270, (Proportion) (Property) Specification for job-mixed mortar and ASTM C 1142 for ready-mixed mortar of types indicated below:
    1. Limit cementitious materials in mortar to portland cement-lime.
    2. Use Type S mortar in the following locations:
        a. Walls that are below grade and in contact with earth.
        b. Load-bearing walls.
        c. Exterior, above-grade, non-load-bearing walls and parapets.
        d. Shear walls.
        e. Areas where another type of mortar is not indicated.
    3. Use Type N mortar in the following locations:
        a. Interior non-load-bearing partitions.
        b. Veneers.

C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
    1. Pigments shall not exceed 10 percent of portland cement by weight.
    2. Pigments shall not exceed 5 percent of mortar cement by weight.
    3. Mix to match Architect's sample.
    4. Application: Use pigmented mortar for exposed mortar joints where indicated on Architectural drawings.

D. Colored Aggregate Mortar: Produce mortar of color required by use of colored aggregates in combination with selected cementitious materials.
   1. Mix to match Architect's sample.
   2. Application: Use colored aggregate mortar for exposed mortar joints where indicated on Architectural drawings.

E. Integral Water Repellent Mortar: Provide admixture for all mortar to be used with integral water repellent masonry units. Admixture must be same manufacturer.

F. Grout for Unit Masonry: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm). Slump: 8 to 11 inches. Minimum 28-day compressive strength: 2,000 psi.
   1. Slump: 8 to 11 inches.
   2. Use grout of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.

G. Self-Consolidating Grout for Unit Masonry: Comply with material requirements of ASTM C476, and slump flow and VSI per ASTM C1611/C1611M
   1. Slump Flow: 24 inches to 30 inches.
   2. Visual Stability Index (VSI) Rating: 1 or less. (Appendix X.1)
   3. Minimum strength: 2,000 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions with installer on-site for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry.
   1. For record, prepare written report, endorsed by installer, listing conditions detrimental to performance of unit masonry.
      a. Verify that foundations are within tolerances specified.
      b. Verify that reinforcing dowels are properly placed.
      c. Verify that substrates are free of substances that impair mortar bond.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

C. Examine mechanical vibrators to be used for grout consolidation prior to grout delivery to verify vibrators are in proper working order.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work or as required by TMS 402/602.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work or as required by TMS 402/602

3.4 PROTECTION OF MASONRY

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
   2. Where one wythe of multi wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to un constructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by 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 onto completed masonry.

3.5 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Flemish bond, match existing.
   2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.
   4. Brick Units:
      a. Bond: Flemish Bond.
      b. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
      c. Mortar Joints: Concave.
   5. Where openings are cut into existing masonry or when existing masonry openings are to be closed with matching masonry units; Edges of openings shall be finished by toothing in new masonry units into the adjacent existing masonry, and openings to be closed shall be closed with matching masonry toothed into the existing adjacent walls to provide a smooth and unaltered appearance.

3.6 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets.

B. Layup walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry as follows unless indicated otherwise in drawings:
   1. Flemish Bond.
   2. Do not use units with less than nominal 4-inch horizontal face dimensions.
   3. Avoid use of less-than-half-sized units at corners, jambs, and where possible at other locations.
   4. Where indicated in drawings, match coursing, bonding, color, and texture of new masonry with existing masonry if not Flemish bond.

D. Lay concealed masonry with units in wythe in running bond or bonded by lapping not less than 4 inches.
   1. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch- horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back one-half unit length for one-half running bond or one-third unit length for one-third running bond. Do not tooth. Clean exposed surfaces of set masonry. Wet clay masonry units lightly if required. Remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-In Work: As construction progresses, build-in items specified under this and other sections of specifications. Fill in solidly with masonry around built-in items.
   1. Fill space between hollow-metal frames and masonry solidly with mortar unless otherwise indicated.
      a. At exterior frames, insert extruded polystyrene board insulation around perimeter of frame in thickness indicated but not less than 3/4 inch to act as thermal break between frame and masonry.
   2. Where built-in items are to be embedded in cores of hollow masonry units, place layer of metal lath in joint below and rod mortar or grout into core.
   3. Fill cores in hollow concrete masonry units with grout three courses (24 inches) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated

G. Build chases and recesses as shown or required to accommodate items specified in this and other sections of specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.

H. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to opening.

I. Nonbearing Interior Partitions: Build full height of story to underside of solid floor or roof structure above and as follows.
   1. Install compressible filler in joint between top of partition and underside of structure above. Brace top of wall as shown in drawings.

J. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
   1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent mortar and grout leakage. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

3.7 INSTALLATION OF MASONRY UNITS

A. General: Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in project.
   1. Masonry units shall be laid true, level, plumb and in uniform coursing in accordance with drawings. Corners and angles shall be square unless otherwise indicated in drawings.
   2. Lay only dry concrete masonry units. Do not wet concrete masonry units unless approved.
   3. Adjust masonry units into final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove mortar, clean joints and units, and relay units with fresh mortar.
   4. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual thickness of masonry units using units of nominal thickness indicated.
   5. Use full-sized units without cutting where possible. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction.

6. Use concrete brick as miscellaneous infill at pockets and elsewhere as needed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

C. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.8 MORTAR BEDDING AND JOINTING

A. Mortar joint at foundation shall not be less than ¼ inch or more than ¾ inch in thickness. Provide full mortar coverage for bed joint at foundation, except do not project mortar into cells to be grouted. Fill head and bed joints of hollow units with mortar for thickness of face shell. Solid units shall have full head and bed joints.

B. Set stone units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone joint surface thoroughly before setting. For stone surfaces that are soiled, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.

C. If it is necessary to remove a unit after it has been set in place, remove unit, clean, and set in fresh mortar.

D. Nominal mortar joint thickness shall be 3/8 + 1/8 inch for precision units and 1/2 + 1/8 inch for slumped units.

E. Mortar joints with wire reinforcement shall be at least twice the wire diameter of the wire.

F. Mortar joints shall be straight, clean, and uniform in thickness.

G. Unless otherwise specified or noted in drawings, tool mortar joints with a concave surface except for the following:
1. Walls to be plastered shall have flush cut or sacked mortar joints.
2. Walls to be concealed by other materials shall have flush cut joints.
3. For joints facing cavities/air spaces, strike joints flush. No voids allowed.

H. Perform tooling when mortar is partially set but still sufficiently plastic to bond. Tooling shall be performed with a tool that compacts mortar.

I. Place and construct control joints as shown in drawings. Keep joints clean from mortar drippings and other debris.

3.9 INSTALLATION OF REINFORCING STEEL

A. Place reinforcement as detailed in drawings. Secure against displacement prior to grouting. Horizontal bars may rest on cross web of hollow units.

B. Tolerances for placement of reinforcing steel in walls and flexural members shall be as follows:
1. Plus/minus 1/2 inch for depth equal to 8 inches or less.
2. Plus/minus 1 inch for depth equal to 24 inches or less but greater than 8 inches.
3. Plus/minus 1 ½ inches for d equal to 24 inches or less.
4. Plus/minus 2 inches for longitudinal location of reinforcement.

C. Clearance between reinforcing steel and surface of masonry shall not be less than ¼ inch for fine grout and ½ inch for coarse grout.

D. Lap reinforcing bars as shown in drawings.

E. Positioners: Provide positioners to maintain position of vertical reinforcing bars at each lap splice or at maximum spacing of 10 feet, whichever is less. Where these positioners are within ½ inch of surface of masonry, galvanize according to ASTM Standard A 153.

F. Provide continuous bond beams reinforced with two No. 5 bars at floors, roof, and tops of parapets unless otherwise noted. Provide corner bars same size as continuous reinforcing in wall corners and intersections, lapped 2 feet with continuous reinforcing.

G. Provide minimum vertical reinforcing of one No. 5 bar in window and door jambs, at ends of walls, corners, and each side of vertical control joints. Locate bar maximum 16 inches from end of CMU.

3.10 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods fully embedded in mortar for their entire length with minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing minimum 6 inches.

B. Install single-wythe horizontal joint reinforcing in concrete masonry veneer at 16 inches on center vertically unless noted otherwise.

C. Provide additional joint reinforcement not more than 8 inches above and below wall openings and extending at least 12 inches beyond openings.

D. Cut or interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

E. Provide continuity at corners by use of prefabricated "L" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

F. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide continuity with:
   1. Horizontal joint reinforcement using prefabricated "T" sections.
   2. Rigid metal anchors at 48 inches on-center.

3.11 GROUTING

A. General:
   1. Use grout to fill masonry. Do not use mortar.
   2. Reinforcement must be in place prior to grouting.
   3. Install vertical grout dams at maximum horizontal spacing of 30 feet to control horizontal flow of grout. For walls partially grouted, use expanded metal lath mesh or other material that will not interfere with bond to restrict grout into only those cells that are to be grouted.
   4. After mortar joints have set, remove protruding mortar fins that excessively constrict grout space.
   5. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
   6. Grout to 1½ inches below top of masonry units for each lift to form and interlock with subsequent masonry and grouting. Where bond beams occur, stop grout pour minimum 1½ inch below top of masonry. At top of masonry, fill grout space flush with tops of units and consolidate.
   7. Solidly grout cells and spaces containing reinforcing steel for partially grouted walls. For solid grouted walls, grout all cells.
   8. Consolidate grout using mechanical vibrator, and reconsolidate using mechanical vibrator after excess water is absorbed into masonry units.
      a. Do not consolidate or reconsolidate self-consolidating grout.

B. Low Lift Grouting:
   1. Construct masonry wall up to 5 feet 4 inches (vertically) at a time. Minimum height of grout lift creating a cold joint shall equal splice length of reinforcing indicated in drawings.
   2. Install vertical and horizontal reinforcing steel, anchors, and embedded items as masonry work progresses.
   3. Grout walls in 5 foot 4 inch maximum lifts, consolidating and reconsolidating each lift. Stop grout 1½ inch below top of top course.
      a. Do not consolidate or reconsolidate self-consolidating grout.

C. High Lift Grouting
   1. Construct masonry wall up to 24 feet maximum without grouting.
   2. Provide cleanout openings at base of wall:
      a. At vertical reinforcing bars.
      b. At spacing of no more than 32 inches on center for solid grouted walls.
      c. At spacing of no more than 48 inches on center for partially grouted walls.
   3. Install horizontal reinforcing steel, anchors, and embedded items as masonry work progresses. . Vertical reinforcing steel may be placed during or after wall is constructed, but must be secured in place prior to grouting.
   4. Provide positioners to secure vertical reinforcement in correct location.
   5. Remove mortar droppings and other debris through cleanouts at base of wall. After cleanouts have been inspected, seal and brace cleanouts.
   6. Grout walls in 5 foot - 4 inch maximum lifts, consolidating and reconsolidating each lift.
      a. Do not consolidate or reconsolidate self-consolidating grout.
      b. Alternate Lift Height: Where the following conditions are met, maximum lift height may be increased to 12 foot 8 inches:
         a) Masonry wall must be cured for a minimum of 4 hours.
         b) No intermediate horizontal reinforcing steel (bond beam) is present.
   7. If grouting is to be stopped for more than one hour during a pour, stop grout 1½ inch below top of uppermost grouted unit (top of pour). Where additional masonry is to be laid above a given pour, stop grout 1½ inch below top of top course.

3.12 BONDING CAVITY WALLS/MULTIWYTHE MASONRY

A. Bond wythes together using one of the following methods:
   1. Individual Two-Piece Wire Ties: Use continuous horizontal joint reinforcing with individual ties installed in horizontal joints spaced not to exceed 16 inches on-center horizontally and 16 inches on-center vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 8 inches on-center around perimeter of openings. Provide two-piece adjustable ties where wythes do not align.
   2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
      a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
      b. Where bed joints do not align, use tab-type horizontal joint reinforcing with adjustable one-piece double-pintle wire ties.
         a) Where one wythe is of clay masonry and the other of concrete-masonry, use adjustable-type (two- piece-type) ties.

3.13 ANCHORED MASONRY VENEER TO LIGHT-GAUGE BACKUP WALLS

A. Anchor single-wythe masonry veneer to metal studs with masonry veneer anchors to comply with the following requirements:
   1. Fasten each anchor section through sheathing and insulation to metal studs as indicated.
   2. Install Self-Sealing Tape behind anchor sections.
   3. Embed tie section in masonry joints. Provide not less than 2-inch air space between back of masonry veneer wythe and face of sheathing or insulation.
   4. Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.
   5. Space anchors as indicated but not more than 16 inches on-center vertically and horizontally. Install additional anchors within 1 foot of openings and at intervals around perimeter not exceeding 8 inches.

B. If masonry veneer is concrete-masonry, provide single-wythe joint reinforcing at 16 inches vertically, staggered with ties.

3.14 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
   1. Provide open space not less than 1 inch wide between masonry and structural member unless otherwise indicated. Keep open space free of mortar or other rigid materials.
   2. Anchor masonry to structural members with adjustable anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated but not more than 16 inches on center vertically and horizontally.

3.15 MOVEMENT (CONTROL AND EXPANSION) JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as masonry progresses. Do not form continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:
   1. Install preformed control joint gaskets designed to fit standard sash block.
      a. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
      b. Unless noted otherwise in drawings, continue reinforcing in bond beams through control joints. Rake vertical joint on each side, and provide backer rod and sealant in joint.
      c. Size control joints as indicated on drawings; if not indicated,3/4 inch (19 mm) wide and 1/2" deep.

C. Form expansion joints in brick made from clay or shale as follows:
   1. Build flanges of factory-fabricated expansion joint units into masonry.
   2. Build in compressible joint fillers where indicated.
   3. Form open joint of width indicated but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7. Maintain joint free and clear of mortar.

D. Build in horizontal pressure-relieving joints where indicated. Construct joints by either leaving air space or inserting nonmetallic, 50 percent compressible joint filler of width required to permit installation of sealant and backer rod specified in Division 7.
   1. Locate compressible filler beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

E. Install nonmetallic expansion joint strips at building expansion joints.

3.16 LINTELS

A. Install as shown on the drawings.

B. Provide masonry lintels where shown and wherever openings of more than 1 foot for brick-sized units and 2 feet for block-sized units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installing. Temporarily support formed-in-place lintels.
   1. For hollow concrete masonry unit walls, use specially formed bond beam units with reinforcement bars filled with coarse grout.
   2. Manufacturer:
      a. Provide Cast-Crete pre-cast lintels or approved equal. www.castcrete.com

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.17 CAVITIES/AIR SPACES

A. Keep cavities/air spaces clean of mortar droppings and other materials during construction. Strike joints facing cavities/air spaces flush. No voids are allowed.

B. Install cavity drainage material. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

C. Installing Cavity-Wall Insulation:

1. For rigid insulation, attached to masonry install small pads of adhesive spaced approximately one foot on-center both ways on inside face or attach to inside face with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
    a. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.
2. For attachment to metal framing backup anchor thru insulation and sheathing into the metal stud using masonry anchors specified. Butt joints tightly both ways. Install tongue and groove panels with tongue in the up position.
    a. Seal all joints between insulation board units in cavity with joint sealing tape, to form a tight seal at all joints, including areas around masonry anchors and other openings. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
3. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

3.18 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in wall and where indicated.

B. Install cavity vents in head joints at top of each continuous air space in cavity and anchored veneer walls.

1. Space vents and close off cavities/air spaces vertically and horizontally with blocking in manner indicated. Space vents to match weep holes at bottom of cavity.
2. Install MortarNet at every floor level. For wall cavities that exceed 11' in height, place an additional continuous trapezoidal strip on wall reinforcing anchors/ties at every 9' to 11' of wall height.
3. Flashing should extend at least 6 " above the top of MortarNet, as should any other materials used to fill space between MortarNet and inside cavity surface.
4. No more than 1/4" should be left between MortarNet and cavity’s inside surface (flashing or filler)
5. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing.
    a. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive/sealant/tape or neoprene gasket as recommended by flashing manufacturer before covering with mortar.

C. Install flashings as follows:

1. At multi-wythe masonry walls: Extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up minimum of 8 inches, and through inner wythe to within 1/2 inch of interior face of wall in exposed masonry.
    a. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn up approximately 2 inches unless otherwise indicated.
2. At anchored veneer walls: Install flashing in masonry veneer walls as specified above, but carry flashing up face of sheathing at least 8 inches and behind air infiltration barrier/building paper or sheathing, lapping at least 4 inches. Fasten with termination bar and sealant.

3. At lintels and shelf angles, extend flashing minimum 6 inches into masonry at each end. Provide end dams by turning upwards flashing at ends of lintels.
4. At heads and sills, extend flashing as specified above unless otherwise indicated, but turn up ends not less than 2 inches to form pan.
5. Install metal flashing termination beneath membrane flashing at exterior face of wall. Stop membrane flashing 1/2 inch back from outside face of wall, and adhere membrane flashing to top of metal flashing termination.

D. 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.

E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashings and as follows:
1. Form weep holes with product specified in Part 2 of this section.
2. Space weep holes 16 inches on center.
3. In cavities/air spaces, place cavity drainage material as indicated in Architectural drawings.

F. Install termination bars, reglets, and nailers for flashing and other related construction where shown to be built into masonry.
1. Install termination bar just below top of flashing.
2. Install sealant at top of flashing and termination bar.

3.19 PARGING

A. Parge pre-dampened masonry walls where indicated with Type S or Type N mortar applied in two uniform coats to total thickness of 1/2 inch. Scarify first parging coat to ensure full bond to subsequent coat.
1. Damp-cure parging at least 24 hours. Protect until cured.

3.20 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, windows, curtain walls, storefronts and anchor bolts and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

3.21 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.22 FIELD QUALITY CONTROL

A. Refer to Section 01 44534 Code Required Special Inspections for additional requirement.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

E. Inspecting installation of anchors, joint reinforcing, cavity insulation, cavity mortar net, weep holes etc.
1. Weep holes shall be tested by placing water (by bucket or hose) into cavity.

3.23 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During joint tooling, enlarge voids or holes except weep holes and completely fill with mortar Point-up joints including corners, openings, and adjacent construction to provide neat, uniform appearance, prepared for application of sealants

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel. Leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with masonry cleaning.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to applying cleaners. Remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised."
6. Clean concrete masonry by means of cleaning method indicated in NCMA "TEK 8-4A" applicable to type of stain on exposed surfaces.
7. Clean limestone units to comply with recommendations in ILI Handbook of Indiana Limestone Institute of America, Inc.

E. Protection: Provide final protection and maintain conditions in manner acceptable to installer that ensures unit masonry is without damage and deterioration at time of substantial completion.

3.24 CONSTRUCTION TOLERANCES

A. Comply with construction tolerances of referenced unit masonry standard.

B. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).

C. Maximum Variation from Unit to Adjacent Unit: as per ASTM.

D. Maximum Variation from Unit to Adjacent Unit: 1/16 inch (1.6 mm).

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

G. Maximum Variation from Cross Sectional Thickness of Wall: 1/4 inch (6 mm).

3.25 FIRE RATED WALL MARKING AND IDENTIFICATION

A. For all masonry walls or partitions indicated to be fire rated, or smoke rated, where there is an accessible concealed floor, ceiling or attic space adjacent to said wall. Contractor shall permanently mark with signs or stenciling within he concealed space, in accordance with IBC 703.7 in concealed spaces.

1. Identifications shall be located within 15 feet of the end of each wall or partition and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
2. Identifications shall include lettering not less than 3 inches in height with a minimum 3/8 inch stroke width in a contrasting color incorporating the wording " FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS"

3.26 WORKMANSHIP

A. Contractor shall be responsible for correction of work not conforming to specified requirements. Correct deficient work as directed by Architect.

B. Remove work found to be defective. Replace with new acceptable work.

END OF SECTION

SECTION 04 7200
CAST STONE MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:

1. Exterior units, including , coping, lintels, and sills.
2. Flooring and paving units, including stair treads.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

B. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

C. Section 07 6200 - Sheet metal flashings and trim

D. Section 07 9200 - Joint Sealants:Materials and execution methods for sealing soft joints in cast stone work.

1.4 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

B. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

C. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

H. ASTM C 231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

I. ASTM C 426 – Standard Test Method for Linear Shrinkage of Concrete Masonry Units.

J. ASTM C 260 – Standard Specification for Air Entrained Admixtures for Concrete.

K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

L. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

M. ASTM C 618 – Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete

N. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

O. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

P. ASTM C 989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete.

Q. ASTM C 1194 – Standard Test Method for Compressive Strength of Architectural Cast Stone

R. ASTM C 1195 – Standard Test Method for Absorption of Architectural Cast Stone.

S. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2017.

T. ASTM D 2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

U. Cast Stone Institute® Technical Manual Cast Stone Institute® Technical Manual.

1.5 DEFINITIONS

A. Cast Stone – a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.
   1. Dry Cast Concrete Products – manufactured from zero slump concrete.
      a. a. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
      b. b. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.
   2. 2. Wet Cast Concrete Products - manufactured from measurable slump concrete.
      a. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.
   1. Include one copy of ASTM C1364 for Architect's use.

C. Shop Drawings: Include plans, elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D. Mortar Color Selection Samples.

E. Verification Samples: Pieces of actual cast stone components not less than 12 inches (305 mm) square, illustrating range of color and texture to be anticipated in components furnished for the project.

F. Full-Size Samples: One unit of each shape, for review.

G. Source Quality Control Test Reports.

H. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm with a minimum of 5 years of experience in producing cast stone of the types required for project and:
   1. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.
   2. Products previously produced by plant and exposed to weather that exhibit satisfactory appearance.

B. Standards: Comply with the requirements of the Cast Stone Institute® Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.

C. Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
   1. Job Site Testing - One (1) sample from production units may be selected at random from the field for each 500 cubic feet delivered to the job site. Perform tests in accordance ASTM C 1194 and C 1195.

2. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
3. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
4. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195

D. Source Limitations for Cast Stone: Obtain cast stone units through one source from a single manufacturer

1.8 DELIVERY, STORAGE, AND HANDLING

A. Package units and protect them from staining or damage during shipping and storage.

B. Provide an itemized list of product to support the bill of lading.

C. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

D. Number each piece individually to match shop drawings and schedule.

E. Store cast stone components and installation materials in accordance with manufacturer's instructions.

F. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

G. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

H. Store mortar materials where contamination can be avoided.

I. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports

J. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Architectural Cast Stone:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
a. Sun Precast Co., Inc.
b. Architectural Cast Stone, Inc
c. Metropole, Clifton, NJ.
d. Substitutions: See Section 01 6000 - Product Requirements.
e. Continental Cast Stone East.
f. Cast-Crete (U Lintels)
g. StoneStrong Systems, Omaha, Nebraska. (Cap stone and dual face block at oudoor seating. See Civil Drawings.)

2.2 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
1. Compressive Strength: 6,500-psi minimum at 28 days
a. Maximum Water-Cement Ratio at Point of Placement: 0.40
2. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days
3. Air Content - ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products

4. Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C 1364. The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
5. Linear Shrinkage - ASTM C 426: Shrinkage shall not exceed 0.065%.
6. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet (6 meters).
7. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 in. 2 (25 mm2) and not obvious under direct daylight illumination at a 5 ft (1.5m) distance.
8. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3m) distance.
9. Color: Match existing.
10. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch (3 mm) or length divided by 360, whichever is greater, but not more than 1/4 inch (6 mm).
2. Unless otherwise indicated on drawings, provide:
a. Wash or slope of 1:12 on exterior horizontal surfaces.
b. Drips on projecting components, wherever possible.
c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.
1. Pieces More than 12 inches (305 mm) Wide: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.3 MATERIALS

A. Portland Cement: ASTM C150/C150M.
1. For Units: Type I, white or gray as required to match Architect 's sample.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C 494/C 494M for water reducing, retarding, accelerating and high range admixtures.

F. Air-Entraining Admixture: ASTM C 260, certified by the manufacturer to be compatible with other admixtures used.
1. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 5 to 7 percent

G. Water: Potable.

H. Reinforcing Bars: ASTM A615/A615M deformed bars, epoxy coated.

I. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

J. Cast Stone Anchor:
1. Stone Anchor: Type 304 stainless steel, 2x6 x 3/16" w/1/4" dowel.
a. #433 by Hohmann & Barnard.
2. Type 304 Stainless Steel, eye rod anchor with 7-1/2" x 1/4" diameter shank,
a. 167-A, with 1-1/2" bend, stone anchor ,by Hohmann & Barnard
3. Spring Loaded Dowel: 3/8" x 4", stainless steel rod with stainless steel spring.

a. #355 Heckmann Building Products.

4. Type 304 Stainless Steel Dowel: 3/8" x 4".
   a. #155 Heckmann Building Products.
5. Stone and Masonry Anchor: Type 304 Stainless Steel, 1" x 16 ga. x length required.
   a. #274 and #275Z by Heckmann Building Products.
6. Anchor Pin: Type 304 Stainless Steel, 8" x 1/2"diameter unless otherwise noted.
   a. #407 by Hohmann & Barnard.
7. Back-up Wall Anchor: Type 304 stainless steel.
   a. "Pos-I-Tie" with triangle wire tie by Heckman Building Industries.
8. Eye Anchor Rod: Heckmann 167.
9. Weld on Clip: Hot dip galvanized 1" x 1-1/4" x 14 gauge, 3/16" offset.

K. Shelf Angles and Similar Structural Items: Type 304 stainless steel, of shapes and sizes as required for conditions. See details for additional steel accessories for stone anchorage.

L. Mortar: Portland cement-lime, as specified in Section 04 0511; do not use masonry cement.

M. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

N. Refer to Section 07 6200 - Sheet Metal Flashing and Trim

O. Section 04 2000 - Unit Masonry for flashings and accessories.

2.4 FABRICATION

A. Provide cast stone units complying with ASTM C 1364.

B. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666, Procedure A, as modified by ASTM C 1364.

C. Reinforce units as indicated and as required by ASTM C 1364. Use epoxy-coated reinforcement when covered with less than 1-1/2 inches of material.
   1. Reinforce units as required for safe handling and structural stress.

D. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.
   1. Slope exposed horizontal surfaces at least 1:12, unless otherwise indicated.
   2. Provide drips on projecting elements.

E. Fabricate all corner coping stones in 90 degree section

F. Cure and finish units as follows:
   1. Cure units in totally enclosed curing room under dense fog and water spray at 95 percent relative humidity for 24 hours.
   2. Yard cure units until the sum of the mean daily temperatures for each day equals or exceeds 350 deg F.
   3. Acid etch units to remove cement film from surfaces indicated to be finished.
   4. Colors and Textures: As selected from manufacturer's full range of colors and textures..

2.5 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 04 0511 - Mortar and Masonry Grout

2.6 ACCESSORIES

A. High Impact resilient setting shims.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:

1. Drench cast stone components with clear, running water immediately before installation.
2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
5. Set dowels with epoxy grout.
6. Build concealed flashing into mortar joints as units are set.

3.3 TOLERANCES

A. Manufacturing Tolerances:

1. Cross section dimensions shall not deviate by more than ±1/8 in. (3mm) from approved dimensions.
2. Length of units shall not deviate by more than length/ 360 or ±1/8 in. (3 mm), whichever is greater, not to exceed ±1/4 in. (6 mm).
    a. 1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
3. Warp, bow or twist of units shall not exceed length/ 360 or ±1/8 in. (3 mm), whichever is greater.
    a. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features - On formed sides of unit, 1/8 in. (3 mm), on unformed sides of unit, 3/8 in.

B. Installation Tolerances:

1. Variation from Plumb: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.
2. Variation from Level: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches (3 mm in 900 mm) or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch (1.5 mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

C. Color and Finish:

1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
    a. Total color difference - not greater than 6 units.
    b. Total hue difference - not greater than 2 units
2. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft (6 m) distance.

3.4 CLEANING

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet (6 m).

1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
2. Repair methods and results subject to Architect 's approval.

B. Clean completed exposed cast stone after mortar is thoroughly set and cured.
1. Wet surfaces with water before applying cleaner.
2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
3. Remove cleaner promptly by rinsing thoroughly with clear water.
4. Do not use acidic cleaners.

3.5 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

C. Protect from splashing by mortar and other damage.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members and struts.

C. Base plates, shear stud connectors.

D. Grouting under base plates.

1.2 RELATED REQUIREMENTS

A. Section 05 2100 - Steel Joist Framing.

B. Section 05 3100 - Steel Decking: Support framing for small openings in deck.

C. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

D. Section 07 8100 - Applied Fireproofing: Fireproof protection to framing and metal deck systems.

1.3 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2023.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022.

C. AISC 325 - Steel Construction Manual; 2017.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

G. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel; 2013 (Reapproved 2018).

H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

J. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2019.

K. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.

L. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.

M. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

N. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.

O. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.

P. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

Q. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

S. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

T. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

U. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

V. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.

W. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

X. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

Y. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

Z. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

AA. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).

AB. SSPC-SP 5 - White Metal Blast Cleaning; 2007.

AC. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

AD. SSPC-SP 7 - Brush-Off Blast Cleaning; 2007.

AE. SSPC-SP 10 - Near-White Metal Wet Abrasive Blast Cleaning; 2015.

AF. SSPC-SP 11 - Power-Tool Cleaning to Bare Metal; 2020.

AG. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

AH. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
2. Connections not detailed.
3. Indicate cambers and loads.
4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
5. Submit Shop Drawings showing details of each individual steel shipping piece.
6. Submit Erection Drawings showing location and attachment of individual steel shipping pieces. Including field installation details in Erection Drawings.
7. Reference Contract Drawing number and addendum number in each shop and Erection drawing.
8. Details including cuts, copes, connections, holes, bolts, and other pertinent information.
9. Submit connection calculations in accordance with Option 3 of AISC Code of Standard Practice for Steel Buildings and Bridges. Calculations shall be stamped by a licensed Professional Engineer in New York State retained by Fabricator.
10. Connections shown on shop drawings shall be coordinated with the submitted connection calculations. Submit written confirmation from Fabricator’s Connection Design Engineer that the shop and erection drawings accurately incorporate the connection designs.
11. Bolt Certification: Submit to Design Engineer certifications that bolts, nuts, and washers furnished comply with specifications. Submit manufacturer's inspection certificates for mill tests. For fasteners to be accepted, lot numbers on kegs, boxes, or bags must correlate with lot numbers shown in accepted test certificates and identification numbers in mill test reports. Manufacturer's symbol and grade markings must appear on bolts and nuts.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Fabricator Test Reports: Comply with ASTM A1011/A1011M.

E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

F. Designer's Qualification Statement.

G. Fabricator's Qualification Statement.

H. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.5 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Fabricator: Company specializing in performing the work of this section with minimum five years of documented experience.

C. Erector: Company specializing in performing the work of this section with minimum five years of documented experience, designated AISC certified.

D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the 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 projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

E. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

F. At completion of fabrication, Fabricator shall submit Certificate of Compliance to Design Engineer stating work was performed in

G. Chapter 17 of the International Building Code

as referenced by the New York State Uniform Code.

H. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in New York.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.

E. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.

F. Steel Plates and Bars: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel.

G. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

H. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.

I. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563/A563M nuts and ASTM F436/F436M Type 1 washers.

J. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

K. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

L. Sliding Bearing Plates: Teflon coated.

M. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch (13.7 MPa).
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch (48 MPa).
   3. Height Change, Plastic State; when tested according to ASTM C827/C827M:
      a. Maximum: Plus 4 percent.
      b. Minimum: Plus 1 percent.

N. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

O. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

D. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance,

and quality of welds and for methods used in correcting welding work
   1. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
      a. Grind butt welds flush.
      b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

      All exposed wells shall be Type 1

2.3 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

C. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils

D.

E. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft 530 g/sq m) galvanized coating.

2.4 SOURCE QUALITY CONTROL

A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least ***** percent of bolts at each connection.

B. Welded Connections: Visually inspect all shop-welded connections and test at least 20 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.2 3.2 PREPARATION

A. A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure,

plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads.

Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

H. H. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and

roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates

I. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

J. Weld plate washers to top of base plate.

K. 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 base or bearing plate before packing with grout.

L. Promptly pack grout solidly between bearing surfaces and base and bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

3.5 TOUCH UP PAINTING

A. After erection is complete, touch up paint-damaged shop coats and welded areas with shop primer paint applied in accordance with manufacturer's instructions.

B. Touch up paint damaged galvanized surfaces and welded areas with galvanizing touch-up compound or cold-galvanizing compound applied in accordance with manufacturer's instructions.

C. Prepare surfaces of hot-dip galvanized members where the galvanization was omitted, or damaged in accordance with SSPC-SP3 "Power Tool Cleaning." Prepare field-welded galvanized members similarly.

3.6 TEMPORARY SHORING AND BRACING

A. Provide temporary shoring and bracing members as required with connections of sufficient strength to bear imposed loads.

B. Remove temporary members and connections when permanent members are in place and final connections are made.

C. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

3.7 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least ____ percent of bolts at each connection.

C. Welded Connections: Visually inspect all field-welded connections and test at least ____ percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

D. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
   1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
      a. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1

END OF SECTION

SECTION 05 2100
STEEL JOIST FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Open web steel joists and shear stud connectors, with bridging, attached seats and anchors.

B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.

C. Supplementary framing for floor and roof openings greater than 18 inches (450 mm).

1.2 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Grouting base plates and bearing plates. Superstructure framing.

B. Section 05 1200 - Structural Steel Framing: Superstructure framing.

C. Section 05 3100 - Steel Decking: Bearing plates and angles.

D. Section 05 5000 - Metal Fabrications: Non-framing steel fabrications attached to joists.

E. Section 07 8100 - Applied Fireproofing: Fireproof protection of joist framing and metal deck systems.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

F. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

G. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

H. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.

I. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.

J. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2019.

K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

L. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

N. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

O. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.

P. SJI 100 - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2011.

Q. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; 2008.

R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

S. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

T. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

U. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).

V. UL (DIR) - Online Certifications Directory; Current Edition.

W. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Designer's Qualification Statement.

E. Manufacturer's Qualification Statement.

F. Fabricator's Qualification Statement.

G. Erector's Qualification Statement.

H. Manufacturer's Data: Submit to Special Inspector and Engineer laboratory test reports and other data as required to show compliance with specifications. Submit producer's or manufacturer's specifications and installation instructions.

I. Comprehensive engineering analysis of special joists showing superimposed loading, web configuration, calculated member stresses, and allowable member stresses. Provide calculations signed and sealed by a New York State licensed professional engineer.

1.5 QUALITY ASSURANCE

A. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in New York.

B. Perform Work, including that for headers and other supplementary framing, in accordance with SJI 100 Standard Specifications Load Tables and SJI Technical Digest No. 9.

C. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

E. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

F. Erector Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Steel Joists:

1. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Open Web Joists: Types as indicated on drawings:

1. Provide bottom chord extensions as indicated.
2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standard.
3. Minimum End Bearing on Concrete or Masonry Supports: Comply with referenced SJI standard.
4. Finish: Shop primed.

B. Anchor Bolts, Nuts and Washers: ASTM A307, hot-dip galvanized per ASTM A153/A153M, Class C.

C. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.

D. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

E. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

A. Frame special sized openings in joist web framing as detailed.

B. Extended Top Chord: Provide extended ends or top chords on joists as shown so as to have sufficient

C. capacity to support loads.

D. Extended Bottom Chord: Provide bottom chord extensions as shown for attachment to beams or columns. Extend ends to within 1/2 inch of member unless otherwise shown.

E. Ceiling Extensions: Provide ceiling extensions in areas having ceiling attached directly to joist bottom chord or as shown. Extend ends to within 1/2 inch of finished wall surface. Extension shall be of sufficient strength to support ceiling construction.

F. Anchorages: Furnish anchor bolts, weld plates, or other connectors required for securing members to other in-place work.

2.4 FINISH

A. Galvanize joists as specified.
1. Do not prime surfaces that will be fireproofed.

B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

C. Galvanizing: Provide minimum 1.7 oz/sq ft (530 g/sq m) galvanized coating to ASTM A123/A123M requirements.

2.5 SOURCE QUALITY CONTROL

A. Provide shop testing of steel components as follows:

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least ____ percent of bolts at each connection.

C. Welded Connections: Visually inspect all shop-welded connections and test at least ____ percent of welds using one of the following:
1. Radiographic testing performed in accordance with ASTM E94/E94M.
2. Ultrasonic testing performed in accordance with ASTM E164.
3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.2 ERECTION

A. Erect joists with correct bearing on supports.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.

D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.

E. Position and field weld joist chord extensions and wall attachments as detailed.

F. Install supplementary framing for floor and roof openings greater than 18 inches (450 mm).

G. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

H. Do not field cut or alter structural members without approval of joist manufacturer.

I. After erection, prime welds, damaged shop primer, damaged galvanizing, and surfaces not shop primed, except surfaces specified not to be primed.

3.3 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm).

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

3.4 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Welded Connections: Visually inspect all field-welded connections and test at least ____ percent of welds using one of the following:

END OF SECTION

SECTION 05 3100
STEEL DECKING

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 SECTION INCLUDES

A. Roof deck and accessories.

B. Composite floor deck and accessories.

C. Metal form deck.

D. Supplementary framing for openings from 6 - 18 inches (150- 450 mm) and at columns.

E. Bearing plates and angles.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete topping over metal deck.

B. Section 05 1200 - Structural Steel Framing: Support framing for openings larger than 18 inches (450 mm).

C. Section 05 2100 - Steel Joist Framing: Support framing for openings larger than 18 inches (450 mm).

D. Section 05 5000 - Metal Fabrications: Steel angle concrete stops at deck edges.

E. Section 07 8100 - Applied Fireproofing: Spray applied fireproofing.

F. Section 09 9113 - Exterior Painting.

G. Section 09 9123 - Interior Painting.

H. Section 26 0533.16 - Boxes for Electrical Systems: Electrical, telephone, and, floor outlets, sleeves, and gaskets.

1.4 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

D. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

E. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

F. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; 2016.

G. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; 2016.

H. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

J. UL (FRD) - Fire Resistance Directory; Current Edition.

K. ANSI Steel Deck Institute NC 1.0-2006 Standard for Non-composite steel floor deck.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, accessories, and including pour stops at slab edges and openings and column closures. Show required weld patterns for deck to supports. Show side lap connections.

C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

D. Certificates: Certify that products furnished meet or exceed specified requirements.

E. Include the following as required:
   1. Each condition requiring closure panels.
   2. Location and attachment of accessories.
   3. Supplementary framing furnished and required.
   4. Special conditions; opening locations.
   5. Side-lap fastening.
   6. Material thickness.
   7. Deck finish.
   8. Cross-section of panel with dimensions.
   9. Layout, size, material, and quantity of shear connectors.
   10. Panels requiring shoring from panel layout.
   11. Powder-actuated corrosion resistant fasteners.

F. Calculations: Submit calculations for powder-actuated fasteners indicating required diaphragm capacity has been provided in accordance with the Performance Requirements section of this Specification and the Drawings.

G. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory," with each deck unit bearing the UL label and marking for specific system detailed.

H. FM Listing: Provide steel roof deck units that have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for Class 1, fire-rated construction.

I. SE
   1. Contractor shall secure services of company field advisor from manufacturer of powder-actuated or pneumatically driven fasteners used to anchor metal deck. Field advisor shall be certified in writing by manufacturer to be technically qualified in product installation. Personnel involved solely in sales do not qualify. Field advisor shall be present at beginning of installation of product and as required during duration of project to:
      a. Render technical assistance to Contractor regarding installation procedures of product to satisfy warranted or guarantee requirements.
      b. Provide specialized training in use of product to Contractor's personnel.
      c. Verify correct fastener is being used for each structural substrate type and thickness.
      d. Verify proper tools and application procedures.
      e. Familiarize Contractor ; Construction Manager; and Testing Agency with entire system, including inspection techniques.
      f. Answer questions that arise.
   2. Field advisor shall prepare a written report summarizing information listed above. Submit report to
      a. Construction Manager; and Testing Agency and design engineer.
   3. Contractor shall be responsible for expenses of field advisor and verifying credentials of advisor.

J. Submit manufacturer's installation instructions.

K. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

L. Fabricator's Qualification Statement: Provide documentation showing steel decking fabricator is accredited under IAS AC172.

1.6 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in State of New York.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

C. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.

D. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
   1. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
      a. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

E. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

C. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling
   1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Steel Deck:
   1. Canam Steel Corporation; -: www.canam-steeljoists.ws.
   2. Nucor-Vulcraft Group; -: www.vulcraft.com.
   3. Substitutions: Section 01 2500 Substitution Procedures.

2.2 STEEL DECK

A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.

B. Galvanized Steel Deck: ASTM A 653, with galvanized coating Designation G 60. Minimum 60,000 psi yield strength.

C. Galvanized and Painted (Shop-primed) Steel Deck: ASTM A 653, with galvanized coating. Designation G 60, extra smooth, with no oil preservatives. Cleaned and phosphatized, with one coat of shop primer. Areas of metal deck to be galvanized and shop primed are indicated in the drawings. Minimum 60,000 psi yield strength.

D. Calculate to structural <<working; limit; or >> stress design<< and structural properties specified; or None - N/A>>.

E. Maximum Vertical Deflection of Floor Deck: <<1/360; 1/240; or >> of span.

F. Maximum Vertical Deflection of Roof Deck: <<1/240; 1/180; or _>> of span.

>> of span.

G. Maximum Lateral Deflection of Diaphragms: <<1/500; or >> of the <<height of the

2.3 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.

B. Welding Materials: AWS D1.1/D1.1M.

C. Fasteners: Galvanized hardened steel, self tapping.

D. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.

1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

E. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
   1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM)SDI design method for roof deck and floor deck applications and ICC-ES AC43.
   2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.
   3. Fasteners for Exposed Steel Roof Deck Application: Manufacturer's standard stainless steel with bonded neoprene washer.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

H. Flute Closures: Closed cell synthetic rubber, 1 inch (25 mm) thick; profiled to fit tight to the deck.

I. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30

J. Column Closures,, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated

K. H.Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck

L. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, [0.0598 inch (1.52 mm)] [0.0747 inch (1.90 mm)] thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

M. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and [level] [sloped] recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field and provide deck supports around recess. Seal watertight.

2.4 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gauge, 0.0299 inch (0.76 mm) thick sheet steel; of profile and size as indicated; finished same as deck.

B. Floor Drain Pans: Formed sheet steel, 14 gauge, 0.0747 inch (1.90 mm) minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches (38 mm) below floor deck surface, bearing flange 3 inches (75 mm) wide, sealed watertight.

2.5 FABRICATION

A. General: Form deck units in lengths to span three or more supports.
   1. Provide flush or 2-inch nested end laps for roof deck, except at joists provide 4-inch nested end laps.
   2. Provide flush end laps for floor deck.
   3. Use <<Lapped, welded; Lapped, mechanically fastened; Button punch; ; or nested side laps>>.
   4. Prior to shipping decking to job site, manufacturer shall wire-brush, grind, clean, and paint scarred areas (weld marks on cellular deck, scratches, rust spots, etc.) on top and bottom surfaces of decking units.
      a. Touch up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
      b. Touch up painted surfaces with shop primer paint applied in accordance with manufacturer's instructions.

c. Galvanized and painted steel deck shall be first touched up with galvanizing repair paint. After paint has cured, touch up with shop primer paint.

d. Unrepaired scarred areas will be evaluated by Architect and may be cause for rejection of deck units.

2.6

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On concrete and masonry surfaces provide minimum 4 inch (100 mm) bearing.

C. On steel supports provide minimum 1-1/2 inch (38 mm) bearing.

D. Install temporary shoring before placing deck panels, where indicated on deck shop drawings. Coordinate with Section 03300 "Cast in Place Concrete"

E. Fasten deck to steel support members at ends and intermediate supports at 12 inches (300 mm) on center maximum, as shown on shop drawings, parallel with the deck flute and at each transverse flute using welds.

1. Welding: Use fusion welds or screwed fasten through weld washers. Not required for 18 ga. deck.

F. Clinch lock seam side laps.

G. At mechanically fastened male/female side laps fasten at 24 inches (600 mm) on center maximum.

H. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

I. At welded male/female side laps weld or screw fasten at 18 inches (450 mm) on center maximum.

J. Weld deck in accordance with AWS D1.3/D1.3M.

K. At deck openings from 6 inches (150 mm) to 18 inches (450 mm) in size, provide 2 by 2 by 1/4 inch (50 by 50 by 6 mm) steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.

L. At deck openings greater than 18 inches (450 mm) in size, provide steel angle reinforcement. as specified in Section 05 1200.

M. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch (150 mm) minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches (300 mm) on center maximum.

N. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion. See Structural drawings for additional information.

O. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

P. Close openings above walls and partitions perpendicular to deck flutes with double row of foam cell closures.

Q. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

R. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up galvanizing paint primer.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements

3.4 REPAIRS AND PROTECTION

A. After installing decking, wire-brush, clean, and paint scarred areas (scratches, weld burn marks, etc.), welds (shop and field), and rust spots on top and bottom surfaces of decking units and supporting steel members.

1. Touch-up paint damaged galvanized surfaces and welded areas with galvanizing touch-up compound applied in accordance with manufacturer's instructions.
2. Touch-up paint damaged shop priming coats with shop primer paint applied in accordance with manufacturer's instructions.
3. Galvanized and painted steel deck shall be first touched up with galvanizing touch-up compound. After paint has cured, touch up with shop primer paint.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces prime-painted deck immediately after installation, and apply repair paint.

C. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

3.5 TOLERANCES

Maximum variation in deck unit alignment shall be 1/4 inch in 40 feet.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Exterior wall sheathing.

B. Exterior non-load-bearing exterior and interior wall framing.

C. Ceiling joist framing.

D. Pararpet wall framing

E. Soffit Framing

F. Hat furring

G. Interior Moisture Barrier

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry for masonry anchors, cavity insulation., and embeded flashings.

B. Section 05 1200 - Structural Steel Framing .

C. Section 05 3100 - Steel Decking.

D. Section 05 5000 - Metal Fabrications for masonry shelf angles and connections.

E. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

F. Section 07 2100 - Thermal Insulation: Insulation within framing members.

G. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

H. Section 07 6200 - Sheet Metal Flashing and Trim: Head and sill flashings.

I. Section 07 9200 - Joint Sealers .

J. Section 09 2116 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

K. Section 09 5100 - Acoustical Ceilings: Ceiling suspension system.

1.4 DEFINITIONS

A. General: See AISI S240 for definitions of terms used in this section.

1.5 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

D. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.

I. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2017.

J. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a (Reapproved 2015).

K. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

L. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

M. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

O. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.7 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated

B. Design Loads: Refer to Structural drawings for the following
   1. Dead Loads:
   2. Live Loads:
   3. Roof Loads:
   4. Snow Loads:
   5. Seismic Loads:

1.8 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations and manufacturer's brochures showing section properties and specifications. .

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, and special framing, and accessories or items required of related work.
   1. Provide elevations showing ceiling joist and stud layout.
   2. Indicate locations of wind bracing straps and connections. For locations see structural drawings.
   3. Describe method for securing studs to tracks and for bolted framing connections.
   4. Show framing above, below and each side of openings with all required fasteners.

E. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction

F. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

G. Designer's Qualification Statement.

H. Engineers qualification statement.

I. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before the start of scheduled welding work.

J. SSMA Manufacturer Qualification: Submit documentation of manufacturer association membership.

K. SSFSA Manufacturer Qualification: Submit documentation of manufacturer association membership.

1.9 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.10 MOCK-UP

A. Provide mock-up of exterior framed wall, including components specified elsewhere, such as insulation, sheathing, window frame, door frame, exterior wall finish, and interior wall finish.

B. Location: As directed.

C. Mock-up may remain as part of the Work.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Framing:
1. CEMCO; _____: www.cemcosteel.com/#sle.
2. ClarkDietrich; _____: www.clarkdietrich.com/#sle.
3. Marino; -: www.marinoware.com.
4. The Steel Network, Inc; -: www.SteelNetwork.com.

B. Framing Connectors and Accessories:
1. Same manufacturer as metal framing.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:

1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100.
2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.

C. Regulatory Requirements: Comply with applicable building code criteria for loads, including seismic loads.
1. Design Loads: As indicated on the drawings.
2. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
3. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
4. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, panel 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.
5. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials

D. Shop fabricate framing system to the greatest extent possible.

E. Deliver to project site in largest practical sections.

2.3 FRAMING MATERIALS

A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.

B. Studs and Track: ASTM C955; studs formed to channel, C- or Sigma-shaped with punched web; U-shaped track in matching nominal width and compatible height.
1. Gauge and Depth: As indicated on drawings.
2. Galvanized in accordance with ASTM A653/A653M, G90/Z275 coating.
3. Provide components fabricated from ASTM A1008/A1008M, Designation SS (structural steel).

2.4 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Power-Actuated Fasteners: Fastener system of type suitable for application indicated, fabricated from

corrosion-resistant materials with capability to sustain without failure a load equal to 10 times the design load as determined by testing in accordance with ASTM E 1190, performed by a qualified independent Testing Agency.

C. Welding: Comply with AWS D1.1/D1.1M.

D. Anchor Rods: ASTM F 1554, Grade 36, threaded carbon steel hooked rods, galvanized.

Washers: ASTM F 844. Finish to match rod type

2.5 WALL SHEATHING

A. Wall Sheathing: See Section 09 2662 - Gypsum Board Assemblies

2.6 ACCESSORIES

A. Interior Vapor Barrier: Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch (0.102 mm) thick, clear.
1. Applied between studs and gypsum board.

B. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

C. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.7 SILL-SEALER GASKETS

A. Ribbed polyethylene foam, 3/16 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

1. Product: Reflectix Inc. #1 School Street, P.O. Box 108, Markleville, IN 46056

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing components are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.2 PREPARATION

A. Structural Wall Foundations: For gaps between wall bottom track and top of foundation 1/4 inch (6.4 mm) or greater, level substrate with loadbearing shims or grout between track and foundation.

3.3 Installation - General

A. Install structural members and connections in compliance with ASTM C1007.

B. General: Prefabricate framing components into assemblies before erection wherever possible. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.

C. Fabricate units in jig templates to hold members in proper alignment and position and to ensure consistent component placement.

D. Fastenings: Attach components by welding, bolting, or screw fasteners as standard with manufacturer unless noted otherwise in drawings.

E. Wire-tying of framing components shall not be permitted.

F. Welds shall be fillet, plug, butt, or seam unless noted otherwise. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

G. Cut framing components squarely or on an angle required to fit tightly with proper bearing against abutting members. Maintain members firmly in position until permanently fastened.

H. Wire-brush shop welds clean, and apply galvanizing repair paint in accordance with ASTM A 780 and manufacturer’s written instructions.

I. Fabrication Tolerances: Fabricate assemblies 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 within plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finish materials.
2. Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.
3. Length of end bearing members shall be within plus or minus 1/16 inch of length shown.

3.4 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 16 inches (- mm) on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches (400 mm) on center; not more than 2 inches (50 mm) from abutting walls and at each side of openings. Connect studs to tracks using clip and tie or fastener method. Studs must bear tight on tracks at top and bottom of wall.
   1. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   2. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

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

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Attach cross studs to studs for attachment of fixtures anchored to walls.

K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

L. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Drawings. Fasten jamb members together to uniformly distribute loads.

M. Provide cross bracing or horizontal bracing at story heights of greater than 14'-0".

N. Install runner tracks and jack studs above and below wall openings in addition to full height double studs. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs

O. Touch-up field welds and damaged galvanized surfaces with primer.

3.5 INSTALLATION OF WALL SHEATHING

A. Refer to Section 09 2662 - Gypsum Sheathing.

3.6 INSTALLATION OF WEATHER BARRIER

A. Refer to Section 07 2500 - Weather Barriers.

3.7 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing. Installation of studs, wind bracing straps and framing at wall openings to be checked against approved shop drawings including connections.

B. Screws and PDF's will be checked for conformance with approved shop drawings. All deficiencies will be noted in field reports and re-inspected until approved.

C. Field and shop welds will be subject to inspection and testing.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace Work that does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

C. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion

3.9 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (- mm).

B. Maximum Variation of any Member from Plane: 1/16 inch (- mm).

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Downspout boots.

B. Steel framing and supports for mechanical roof support systems and framing supports and bracing for screens, and similar items indicated on drawings.

C. Steel framing and supports for framing and supports for operable partitions .

D. Steel framing and supports for applications where framing and supports are not specified in other Sections.

E. Loose lintel where required, shown on drawings or for work under this section.

F. Elevator machine hoist beams.

G. Support angles for elevator door sills.

H. Steel weld plates and angles for casting into concrete not specified in other Sections.

I. Metal elevator pit ladder.

J. Elevator pit steel ladder.

K. Metal bollards.

L. Abrasive metal nosing for concrete stairs.

M. Pit Covers

N. Slotted channel framing.

O. Projector Mounts.

P. Television mounting brackets

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 1200 - Structural Steel Framing: Structural steel column anchor bolts.

D. Section 05 2100 - Steel Joist Framing: Structural joist bearing plates, including anchorage.

E. Section 05 3100 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

F. Section 005 4000 - Cold-Formed Metal Framing.

G. Section 05 5213 - Pipe and Tube Railings.

H. Division 7 for roofing and sheet metal flashings for roof penetrations and installations associated with steel support roof framing.

I. Section 07 7200 - Roof Accessories (Roof Ladders)

J. Section 09 2116 - Gypsum Board Assemblies for miscellaneous framing associated with metal stud framing .

K. Section 09 9113 - Exterior Painting.

L. Section 09 9123 - Interior Painting.

M. Section 14 2100 - Electric Traction Elevators for miscellaneous framing required for elevator installation.

1.4 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

J. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019.

K. ASTM B85/85M - Standard Specification for Aluminum-Alloy Die Castings; 2014.

L. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

M. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

N. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

O. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2012.

P. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

Q. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

S. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

T. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

U. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For the following:
   1. Metal nosing
   2. Ladders.
   3. Elevator pit ladder.
   4. Metal bollards.
   5. Metal downspout boots.
   6. Projection mounts and associated supports.
   7. Pit covers and frames.
   8. Roof supports.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
   3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer, licensed in the State of New York, responsible for their preparation.

D. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.7 QUALITY ASSURANCE

A. Design engineering under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in New York.

B. 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent

C. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
   2. Provide allowance for trimming and fitting at site.

1.9 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

F. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-'Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.

D. Bolts, Nuts, and Washers: Stainless steel.

2.3 MATERIALS - STAINLESS STEEL

A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316L.

B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.

2.4 FABRICATION

A. Shop Assembly: Preassemble rolled steel members in the shop. Other items also preassemble in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work

D. Fit and shop assemble items in largest practical sections, for delivery to site.

E. Fabricate items with joints tightly fitted and secured.

F. Continuously seal joined members by continuous welds.

G. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Do not use ferrous material and equipment on stainless steel components.
3. Obtain fusion without undercut or overlap.
4. Remove welding flux immediately.

5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface

H. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep hole es where water may accumulate

I. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

J. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

K. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

C. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594

2.6 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; painted finish.

1. Comply with ANSI A14.3, unless otherwise indicated.
   a. For elevator pit ladders, comply with ASME A17.1.
   b. Side Rails: 3/8 x 2 inches (9 x 50 mm) members spaced at 20 inches (500 mm). Extend a minimum 42" above finish floor level.
   c. Rungs: 3/4 inch (- mm) diameter solid round bar spaced 12 inches (300 mm) on center.
   d. Space rungs 7 inches (175 mm) from wall surface.
   e. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process

B. Fixed Bollards:

1. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.
2. Diameter: 6 inches
3. Material: Schedule 40 steel pipe galvanized
4. Cap bollards with prefabricated 1/4-inch- thick steel cone cap.
5. Sleeves steel pipe 1/4-inch thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
6. Concrete filled for fixed bollards.
7. Polyethylene Plastic Covers: High-density polyethylene (HDPE).

a. Color as selected by the Architect.

8. Product: Basis of Design Distributor: Reliance Foundry Company; 1-8877-789-3245. www.reliance-foundry.com.
9. Use where shown on drawings.

C. Lintels: As detailed. Finish: Prime paint interior lintels; galvanized for exterior lintels. Refer to Section 09 9000 - Painting and Coating.
1. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated
2. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
3. Galvanize loose steel lintels located in exterior walls.

D. Pit Frame and Grating: Provide aluminum grating sump pit cover and frame for elevator pit.
1. Coordinate with elevator and plumbing drawings.
2. Product: Balco Inc Wichita, KS 67217, 800.767.0082, MR-10A or equal.

E. Elevator Hoistway Beams: Beam sections as indicated on drawings; prime paint finish.

F. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Steel complying with ASTM A 1008/A 1008M, commercial steel, Type B; 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel. Color as selected by Architect.
3. Provide where shown on drawings
4. Basis of Design: . UniStrut P-1000 Channesl
a. Rods: 1/2 diameter.
b. Fittings: "U" shape 13/16" x 2-15/16".

G. Projector mount
1. Ceiling mounted
a. Minimum 1-1/2” diameter schedule 10 NPT pipe, threaded and slotted on each end..
b. Provide miscellaneous framing as required to support ceiling mount from existing steel joists.
c. Provide mounting pipes as required to provide the required height.
d. Mount shall support a minimum of 26 lbs.
e. Provide 10 gauge cold rolled ceiling plate
f. Provide safety belts to secure projector in place.
g. Mount shall be capable of 360° swivel and 0-30° tilting.
h. Finish shall be black.
i. Provide where shown on drawings: 44 ½” Length.
j. Product:“Aero Accuset” as manufactured by Draper, Inc.

H. Television Mounting Brackets:
1. Ceiling Mounted.
a. Ceiling mounted. Model #CMY-3140 as manufactured by Da-Lite Screen Company.
b. Provide hardware kits for concrete and uni-strut support..
c. Mount shall support a max. of 300 lbs.
d. Provide pipe coupling and escustion ring. Lengths as required.
e. Provide safety belts to secure monitor in place.
f. Mount shall be capable of 360 degrees swivel and 0-15 degrees tilting.
g. Finish shall be black.

h. Product: "Model #CMY-3140" as manufactured by Da-Lite Screen Company.
i. Provide where shown on drawings: 44 ½" Length.

I. Abrasive Metal Nosings.
1. Cast aluminum stair nosing, with abrasive filler consisting of #24 virgin grain silicon carbide in an epoxy-resin binder. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions
2. Surface Design: Cast aluminum solid surface tread plate 3/16 inch thick, 4" wide.
3. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
a. Space anchors 3" from ends and 12" oc.
4. Apply bituminous paint to concealed bottoms, sides, and edges of cast-metal units set into concrete
5. Available Manufacturers:
a. American Safety Tread Co., Inc., Style 801, with aluminum cast wing anchor

2.7 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include cleanout cover and tamper proof fasteners.
1. Configuration: Straight.
2. Material: Cast Aluminum.
3. Size: 4" x 6".
4. Outlet: Circular to discharge into drainage system. Coordinate with site work.
5. Finish: Manufacturer's standard factory applied powder coat finish.
6. Color: To be selected by Architect from manufacturer's standard range.
7. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.
8. Product:
a. "Type B25C" as manufactured by Barry Craft Construction Casting Company; 1-800-524-1809..
b. Substitutions: Section 01 2500 Substitution Procedures .

2.8 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.9 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Exterior Ferous Metal: Galvanizing of Structural Steel Members after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft (530 g/sq m) galvanized coating.

D. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.10 FINISHES - STEEL

A. Refer to Section 09 9113 Exterior Painting and 09 9123 Interior Painting.

B. Prime paint steel items.

C. Prepare surfaces to be primed in accordance with SSPC-SP2.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat.

1. Interior ferrous metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664
2. Exterior ferrous metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
   a. Finish shall be black.
3. Touch-'Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
4. Exterior Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat
5. Dunnage to receive primer and Tnemic weatherproof topcoat.

F. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft (530 g/sq m) galvanized coating.
   1. Fastener Locations:
      a. Locations as shown on drawings.

G. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.11 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I natural anodized.

B. Interior Aluminum Surfaces: Mill finish.

C. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; color as indicated.

D. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.12 STAINLESS-STEEL FINISHES

A. Use only stainless steel tools, grinders and polishing materials.

B. Remove tool and die marks and stretch lines or blend into finish

C. Unless otherwise indicated, grind and polish surfaces to produce uniform finish indicated, free of cross scratches

D. Directional Satin Finish: Type 316L.

E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean

2.13 FABRICATION TOLERANCES

A. Squareness: 1/16 inch (- mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

A. Install fabricated items as per manufacturer's instructions

B. Install items plumb and level, accurately fitted, free from distortion or defects.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components as indicated on drawings.

E. Perform field welding in accordance with AWS D1.1/D1.1M.

F. Obtain approval prior to site cutting or making adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/8 inch (3 mm).

C. Maximum Out-of-Position: 1/8 inch (3 mm).

END OF SECTION

SECTION 05 5100
METAL STAIRS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel stair framing and supports.

B. Handrails and guards.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 05 5000 - Metal Fabrications.

C. Section 05 5213 - Pipe and Tube Railings

D. Section 09 9123 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2022.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

N. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

P. NAAMM AMP 510 - Metal Stairs Manual; 1992.

Q. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

R. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

S. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Design Data, Seismic Performance: Submit documentation that stairs meet performance requirements specified.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.5 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in New York, or personnel under direct supervision of such an engineer.

B. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
   2. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.1 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies that comply with applicable code and contract documents.. Calculations shall be prepared, signed and stamped by licensed structural engineer indicating compliance to applicable code requirements.
   4. Dimensions: As indicated on drawings.
   5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   7. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.2 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: See Section 05 5213.

B. Guards: Pipe railings, see Section 05 5213.

2.3 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

2.4 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, and comply with VOC limitations of authorities having jurisdiction.

2.5 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.

1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
2. Number of Coats: One.

D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.

1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Metal stairs, posts, wall, free standing, and railings.

B. Free-standing railings at steps.

C. Wire mesh infill panels for railings, guardrails and stairs.

D. Retainer channels as required to accept wire mesh infill panels.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 04 2000 - Unit Masonry: Placement of anchors in masonry.

C. Section 05 5100 - Metal Stairs

D. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

E. Section 09 9123 - Interior Painting: Paint finish.

1.4 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

F. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.

G. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Arrange for all railings and handrails specified in this Section to be fabricated and installed by the same firm.

B. 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 metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.

C. Fabricator Qualifications: A firm, with a minimum of five (5) years experience in producing metal stairs & railings 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. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.2 Structural Welding Code – Aluminum.

1.6 PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding the allowable design working stress of materials for handrails, railings, anchors, and connections:
   1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
      b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
      b. Uniform load of 50 lbf/ft. applied in any direction.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
      a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guards.
   4.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   1. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Show all retainer channels and connections for wire mesh infill panels.

D. Samples: Submit two, 12 inch (300 mm) long samples of finish handrail for each type. Submit two samples of elbow, tee, wall bracket, and end stop.

E. Designer's Qualification Statement.

F. Fabricator's Qualification Statement.

G. Retainer channels.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements: Provide railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.

B. Handrails: Comply with applicable accessibility requirements of ADA Standards.

C. Structural Design: Provide complete railing assemblies complying with New York State Code.
   1. Railing Assemblies: Comply with ASTM E985.

D. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in New York, or personnel under direct supervision of such an engineer.

E. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

F. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience. Arrange for railings in this section to be fabricated and installed by the same firm.

G. Fabricator Qualifications:
1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
2. A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
3. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
4. AWS D1.1, "Structural Welding Code--Steel AWS D1.3, "Structural Welding Code--Sheet Steel

PART 2 PRODUCTS

2.1 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot (1095 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

G. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
1. Outside Diameter: as indicated on drawings.
2. Finish: Stainless steel interior and exterior.

H. Dimensions: See drawings for configurations and heights.

I. Guards:
1. Dimensions: See drawings for configurations and heights.
2. Top Rails and Posts: as indicated on drawings. (Primed, painted steel)
3. End and Intermediate Posts: Same material and size as top rails. (Primed , painted steel.)
a. Horizontal Spacing: As indicated on drawings.
b. Mounting: Welded to top surface of stringer.

J. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. For anchorage to stud walls, provide backing plates, for bolting anchors.

K. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.2 STEEL RAILING MATERIAL (Except Handrails)

A. **All components of interior guard railings, post, mesh etc. shall be painted steel. All handrails and connectors and brackets for handrails shall be stainless steel.**

B. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

C. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

F. Straight Splice Connectors: Steel welding collars.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Finish: All components shall be steel painted except for wall and stair hand railings which shall be stainless.

2.3 STAINLESS STEEL MATERIAL (Handrails and related accessories)

A. **All components of exterior and interior Handrails, connectors and brackets shall be stainless steel**.

B. All stainless steel shall be as follows:
   1. Tubing: ASTM A 554, Grade MT 316L.
   2. Handrails Pipe: ASTM A 312/A 312M, Grade TP 316L.
   3. Plate and Sheet: ASTM A 666, Type 316L.
   4. Expanded Metal: ASTM F 1267, Type II (expanded and flattened), made from stainless-steel sheet complying with ASTM A 666, Type 316.

2.4 BRACKETS, CONECTORS AND MISCELLANEOUS ITEMS

A. Wall Brackets: Provide wall brackets as follows:
   Model 1980SS for stainless steel railings.

B. Expansion Connector: as manufactured by Wagner Company.
   1. Steel painted for interior and stainless steel for exterior.

C. Wall Returns: Wagner steel wall return with two (2) holes.
   1. Stainless steel with stainless steel railings.

D. Base Flanges: Wagner heavy flush base flanges.
   1. Stainless steel with stainless steel hand railings.

2.5 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Division 9 painting Sections.
   1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

C. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.6 FABRICATION

A. Provide complete assemblies including handrails, railings, clips, brackets other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding, unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces

B. Shop Assembly: Pre-assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

C. Accurately form components to suit specific project conditions and for proper connection to building structure.

D. Fit and shop assemble components in largest practical sizes for delivery to site.

E. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

F. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work

G. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by continuous welds.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

H. Close exposed ends of railing members with prefabricated end fittings.

I. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work
   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
   2. Connect railing posts to stair framing by direct welding.
   3. For ungalvanized handrails and railings, provide ungalvanized ferrous metal fittings, brackets, fasteners and sleeves.
   4. For all exterior applications and use stainless steel or aluminum anchors, including anchors embedded in exterior masonry and concrete construction.

K. Fasteners: Provide hex set screws for all fasteners.

L. Toe Boards: Provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated and if not indicated a minimum of 6” high..

M. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

N. **INFILL MESH**
   1. Infill at Mesh Railings: Woven wire mesh panels.

a. Wire Size: 0.192-inch- diameter, lock-crimp steel wire woven inserted through frame holes and welded into frame.
b. Wire Spacing: 2" x 2" x 1/8" inch (50 x 50 mm).
c. Retainer Channel: ½" x ½" steel channel to accept welded wire mesh
   a) Mounting: Mesh welded to retainers.
d. Finish: Steel painted for interior and interior

2.7 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.4 INSTALLING STEEL RAILINGS AND HANDRAILS

A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
   1. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post installed anchors and bolts.
   2. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
      a. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
      b. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
      c. For hollow masonry anchorage, use toggle bolts.
      d. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.
      e. Wire Mesh Railing Insert Panels: Attach wire mesh railing insert panels to railing system by welding as specified and indicated on Drawings

3.5 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Subflooring.

B. Underlayment.

C. Fire retardant treated wood materials.

D. Communications and electrical room mounting boards.

E. Concealed wood blocking, nailers, and supports windows, toilet accessories, casework, and hardware.

F. Miscellaneous wood nailers, furring, and grounds.

1.3 RELATED REQUIREMENTS

A. Section 06 1010 - Roof Related Rough Carpentry.

B. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

C. Section 122113 - Horizontal Louver Blinds

D. Section 123200 - Plastic Laminated Casework.

1.4 REFERENCE STANDARDS

A. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2018a.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

D. ICC (IBC) - International Building Code; 2018.

E. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

F. PS 20 - American Softwood Lumber Standard; 2015.

G. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on lumber, plywood, fasteners, and application instructions .

C. Shop drawings, or 2 foot long on-site samples which show the size, shape, configuration and method of fastening for all wood blocking assemblies, and which show how the blocking assemblies will relate to other adjoining work.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

E. Material Safety Data Sheets

1.6 QUALITY ASSURANCE

A. A firm (Installer) with not less than 5 continuous years experience performing carpentry work comparable to that required for this project, employing personnel skilled in the work specified.

B. The Installer shall directly employ the personnel performing the work of this section.

C. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.
2. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.
3. Pre-Work Conference: Attend the pre-roofing meeting to discuss how carpentry work will be performed and coordinated with other work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Deliver and store materials dry at all times.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a two (2) year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
1. Wood, including shims, nailers, blocking, furring and similar members, in the sizes indicated, worked into the shapes shown.
2. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.
3. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.
4. Pre-Work Conference: Attend the pre-roofing meeting to discuss how carpentry work will be performed and coordinated with other work.
5. Species: Douglas Fir, unless otherwise indicated, construction grade solid lumber free of splits, large knots and other imperfections.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: Kiln-dry or MC15.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.

2.3 CONSTRUCTION PANELS

A. Subflooring: Plywood . 3/4" ACX Tongue and Groove , Sanded
1. Bond Classification: Exterior.
2. Performance Category: 23/32 PERF CAT.
3. Span Rating: 24.
4. Edges: Tongue and groove.
5. Surface Finish: Fully sanded face.
6. Exposure 1.
7. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 200 days.
8. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.

9. Products:
   a. Georgia-Pacific LLC: www.buildgp.com/#sle.
   b. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.

B. Underlayment: APA Underlayment A-C; plywood, Exposure 1, 3/4 inch (- mm) thick. Tongue and groove edges, Fully Sanded

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.4 ACCESSORIES

A. Fasteners and Anchors:
1. General: Provide fasteners of size and type that comply with requirements specified in this article by the authority having jurisdiction, International Building Code, International Residential Code, Wood Frame Construction manual, and National Design Specification
2. Metal and Finish: Hot-dipped galvanized steel as per ASTM A153/A153M for exterior, wet areas, and high humidity areas and unfinished steel for other wood locations.
3. Use screws wherever possible, minimum size diameter #12. If nails are used they shall be annular ring shank type. Do not use dry wall screws to secure wood blocking assemblies.
4. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.
1. Products:
   a. Franklin International, Inc; Titebond Subfloor Construction Adhesive: www.titebond.com/#sle.

2.5 FACTORY WOOD TREATMENT

A. Fire Retardant Treatment:
1. Products:
   a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
   b. Koppers, Inc: www.koppers.com.
   c. Substitutions: 01 2500 - Substitution Procedures

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Coordinate carpentry work with the installation of other related work.

D. Shim and set carpentry work plumb and true.

E. Stagger joints in built up assemblies at least 2 feet to obtain maximum strength. Provide the appropriate shapes needed and adjust wood members to suit existing conditions for full bearing and secure attachment. Discard defective material, and pieces which are too small, and fabricate the work with a minimum of joints and an optimum joint arrangement.

F. Securely attach carpentry work by fastening it using recognized standards, to resist a pull of 275 pounds per lineal foot in any direction. Countersink all fasteners flush unless otherwise shown.

G. Space fasteners to achieve adequate holding power, generally as follows:

1. Anchor bolts embedded in concrete, drilled anchors into concrete or masonry, screws into a steel deck or structural steel member, or screws into wood framing: 12 inches on center.
2. Nails into wood: 8 inches on center.
3. Install two rows of fasteners on blocking wider than 5 inches.

H. Fit carpentry work neatly scribed and cut to fit within 1/8 inch of adjoining materials. Position furring, nailers, blocking, shims and similar supports for the proper attachment of subsequent work.

I. Fasten wood blocking to underlying steel members at gypsum deck areas, with self tapping screws. Pre-drill holes in the steel members or utilize self drilling/tapping screws.

3.3 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Provide the following specific nonstructural framing and blocking:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Visual display boards
8. Windows.
9. Roof related nailers and blocking..

3.4 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring: Glue and nail to framing; staples are not permitted.

B. Underlayment: Secure to subflooring with nails and glue.
1. At locations where resilient flooring will be installed, fill and sand splits, gaps, and rough areas.
2. Place building paper between floor underlayment and subflooring.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated or required as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.

3.5 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet (1 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.6 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.7 CLEANING AND PROTECTION

A. General: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
1. Comply with applicable regulations.

2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 1010
ROOF RELATED ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and including, but not limited to, the following:
   1. Related wood nailers, blocking, and shims.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry.

B. Section 07 5419 - PVC Roofing

C. Section 07 6200 - Sheet Metal Flashing and Trim

D. Section 07 7200 - Roof Accessories.

1.4 REFERENCE STANDARDS

A. APA PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels (Form E445); 2001.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

D. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012.

E. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2017a.

F. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

H. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

K. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

L. ICC (IBC) - International Building Code; 2018.

M. ICC (IECC) - International Energy Conservation Code; 2018.

N. ICC-ES AC310 - Acceptance Criteria for Water-resistive Membranes Factory-bonded to Wood-based Structural Sheathing, Used as Water-Resistive Barriers; 2008, with Editorial Revision (2015).

O. PS 1 - Structural Plywood; 2009.

P. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.

Q. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing carpentry work comparable to that required for this project, employing personnel skilled in the work specified.
2. The Installer shall have a full time supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience in work similar in nature and scope to this project, and speak fluent English.

B. Pre-Construction Conference: Attend the pre-construction meeting to discuss how and when carpentry work will be performed and coordinated with other work, and how the building will be kept watertight as work occurs.

1.6 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any work on site:
1. A pre-work site and building inspection report with photos, to document conditions before work starts.
2. Mill or Manufacturer data sheets to identify the source for each type of lumber and fastener.
3. Shop drawings or 2 foot long on-site samples which show the size, shape, configuration and method of fastening for all wood blocking assemblies, and which show how the blocking assemblies will relate to other adjoining work.
4. Simultaneously provide all technical data submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
   a. Submittals shall be prepared and made by the firm that will perform the actual work.
   b. Provide electronic submittals in pdf format, organized in folders by Section.

B. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building to the Construction Manager.

C. Payment requisitions will not be processed until all submittals are received and approved.

D. Manufacturer's Certificate: Certify that wood products supplied meet or exceed specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials dry at all times.
1. Cover with tarps and protect against exposure to weather and contact with damp or wet surfaces.

B. Support stacked products to prevent deformation and to allow air circulation.

C. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

D. Do not overload the structure when storing material on the roof. Material stored on the roof shall be placed on 2 by 10 wooden planks, placed over 1-1/2 inch foam insulation, that is laid on a layer of 6 mil fire retardant polyethylene.

1.8 GUARANTEE

A. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:
1. Defects includes but are not limited to the following: leakage, delamination, lifting, loosening, splitting, cracking, warping and undue expansion.
2. The Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
3. Guarantee coverage shall include removing and replacing items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.

B. Refer to Section 01 7800 - Closeout Submittals for additional requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wood, including shims, nailers, blocking, furring and similar members, in the sizes indicated, worked into the shapes shown, and as follows:
   1. Lumber: Douglas Fir dimension lumber, free of large knots and other imperfections.
   2. Plywood: Exterior grade APA rated
      a. Parapets: 3/4" ACX
      b. Facia board substrates: 3/4" ACX

B. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.
   2. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.
   3. Pre-Work Conference: Attend the pre-roofing meeting to discuss how carpentry work will be performed and coordinated with other work.

C. Lumber fabricated from old growth timber is not permitted.

D. Pressure treated lumber not permitted.

E. Metal including light gage metal channels and studs shall be factory formed of minimum 24 gauge cold, unless otherwise noted, formed galvanized steel.
   1. Refer to Section 05 4000 - Cold-Formed Metal Framing for additional information.

2.2 FASTENERS

A. Hot dipped galvanized steel, stainless steel, or steel covered with a proprietary rust inhibiting coating.

B. Use screws wherever possible, minimum size diameter #12. If nails are used they shall be annular ring shank type. Do not use dry wall screws to secure wood blocking assemblies.

C. Use stainless steel threaded adhesive anchors for fastening wood blocking to solid masonry.
   1. Hilti "HIT-HY 150" or equal.

D. Hot dipped galvanized steel, stainless steel, or steel covered with a proprietary rust inhibiting coating.

E. Metal and Finish: Stainless steel for high humidity and preservative-treated wood locations, hot dipped galvanized steel elsewhere.

2.3 ACCESSORIES

A. Batt Insulation: un-faced fiberglass insulation, minimum thickness 6 inches, R=30, as needed to fill the expansion joints.

B. Polyethylene: 6 mil thick fire retardant polyethylene sheeting.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Coordinate carpentry work with the installation of the roofing system, insulation, flashings, and other similar items.

B. Shim and set carpentry work plumb and true, except provide slope at the top surfaces of horizontal members as indicated.

C. Stagger joints in built up assemblies at least 2 feet to obtain maximum strength. Provide the appropriate shapes needed and adjust wood members to suit existing conditions for full bearing and secure attachment. Discard defective material, and pieces which are too small, and fabricate the work with a minimum of joints and an optimum joint arrangement.

D. Securely attach carpentry work to resist a pull of 275 pounds per lineal foot in any direction. Countersink all fasteners flush unless otherwise shown.

E. Space fasteners to achieve adequate holding power, generally as follows:
   1. Anchor bolts embedded in concrete, drilled anchors into concrete or masonry, screws into a steel deck or structural steel member, or screws into wood framing: 12 inches on center.
   2. Nails into wood: 8 inches on center.
   3. Install two rows of fasteners on blocking wider than 5 inches.

F. Fit carpentry work neatly scribed and cut to fit within 1/8 inch of adjoining materials. Position furring, nailers, blocking, shims and similar supports for the proper attachment of subsequent work.

G. Fasten wood blocking assemblies to metal decks with #12 screws. Pre-drill holes as needed. .

3.2 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Contractor shall inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any leaks or damage, prior to performing any work.

B. The Architect, Owner, or Construction Manager will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.

F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.3 WASTE DISPOSAL

A. Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.

B. Comply with applicable regulations.

C. Do not burn scrap on project site.

D. Do not burn scraps that have been pressure treated.

E. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Wood Stair Treads

B. Wood casings and moldings.

C. Hardware and attachment accessories.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 08 1416 - Flush Wood Doors.

D. Section 09 9123 - Interior Painting:

E. Section 09 9300 - Staining and Transparent Finishing:

1.4 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, installation of associated and adjacent components, and carpentry/ cabinets.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
3. Include certification program label.

D. Samples: Submit two samples of wood trim and stair tread 12 inch (- mm) long.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.

2.2 LUMBER MATERIALS

A. Hardwood Lumber: Species; Cherry where indicated on drawings @ Cafetorium stage, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

2.3 SHEET MATERIALS

A. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1, Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.4 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Concealed Joint Fasteners: Threaded steel.

2.5 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Profile cherry stair ttreads to configuration as indicated on drawings.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.6 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.
   2. Opaque:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Color: As selected by Architect.
      c. Sheen: Flat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.3 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9123.

3.4 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 07 1113
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Bituminous dampproofing
   1. Exterior, below-grade surfaces of concrete foundation walls and structures. (No heated or open space on inside of wall).
   2. Back side of concrete retaining walls, stair and cheek walls below grade.
   3. Exterior face of inner wythe of exterior masonry cavity walls except where fluid air barrier is being installed.
   4. Interior face of exterior concrete and masonry walls, above grade.
   5. Exterior columns, beams, lintels , and hangers not receiving concealed flashings or embedded in concrete.
   6. Protection boards.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry.

B. Section 07 1300 - Sheet Waterproofing.

C. Section 07 2100 - Thermal Insulation

D. Section 31 2200 - Earth Moving

E. Section 31 2316 - Excavation - Building

1.4 REFERENCE STANDARDS

A. ASTM D449/D449M - Standard Specification for Asphalt Used in Dampproofing and Waterproofing; 2003 (Reapproved 2014).

B. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).

C. ASTM D1227/D1227M - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2019.

D. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013.

E. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Certification by dampproofing manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs)

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of this section with at least five (5) years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.

B. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed

C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured

PART 2 PRODUCTS

2.1 GENERAL

A. Odor Elimination: For interior and concealed-in-wall uses, provide type of bituminous dampproofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.

B. Asbestos Free: All material shall be asbestos free.

C. Bituminous Dampproofing Manufacturers:

2.2 BITUMINOUS DAMPPROOFING

A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.

1. Asphalt-Base Emulsion for Metal Protective Coating: ASTM D1187/D1187M, Type I - Continuous water exposure within few days after drying or Type II - Continuous weather exposure after drying.
2. Emulsified Asphalt for Roofing Protective Coating: ASTM D1227/D1227M, Type II, Class 1 - Mineral colloid emulsifying agents with non-asbestos fibers.
3. VOC Content: Not more than permitted by local, State, and federal regulations.
4. Applied Thickness: 1/16 inch (1.5 mm), minimum, wet film.
5. Products:
   a. W. R. Meadows, Inc; Sealmastic Emulsion Type I (spray-grade): www.wrmeadows.com/#sle.
   b. Substitutions: Section 01 2500 Substitution Procedures.

2.3 ACCESSORIES

A. Protection Board: 1/8-inch (3 mm) thick biodegradable hardboard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.3 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Site underground pre-cast concrete structures, catch basins, etc; Provide one coat of asphalt damproofing. Protection board is not required at these locations.

C. Patch disturbed areas of existing dampproofing with two coats of new dampproofing of the same generic type.

D. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

E. Prime surfaces at a rate approved by manufacturer for application indicated, and allow primer to dry thoroughly.

F. Apply bitumen with roller.

G. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees F (14 degrees C); do not exceed finish blowing temperature for four hours.

H. Apply from 2 inches (50 mm) below finish grade elevation down to top of footings.

I. Seal items watertight with mastic, that project through dampproofing surface.

J. Place protection board directly over dampproofing, butt joints, and adhere to tacky dampproofing.

K. Scribe and cut boards around projections, penetrations, and interruptions.

L. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required

M. On Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, one fibered brush or spray coat at not less than 3 gal./100 sq. ft., or one trowel coat at not less than 4 gal./100 sq. ft.

N. On Backs of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft..

O. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.

1. Lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
2. Do not apply dampproofing where fluid spray barrier is required.

P. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least 1/4 inch (6 mm) onto shelf angles supporting veneer

Q. On Interior Face of Single-Wythe Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.

R. On exterior steel: Apply one brush or spray coat at not less than 1 gal./100 sq. ft.

S. On exterior surfaces of concrete site drainage accessories, catch basins, inlets, manholes, etc; Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft..

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Blindside HDPE reinforced sheet membrane.

B. Sheet Waterproofing:

1. Self-adhesive membrane, consisting of preparation of existing and repaired concrete surfaces, sealing of cracks and joints, and application of sheet membrane waterproofing.

C. Waterstops.

D. Below-grade waterproofing accessories.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.

B. Section 07 2100 - Thermal Insulation: Insulation used for drainage board and protective cover.

C. Section 07 9200 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not required to be treated in this section.

D. 33 4100 - Foundation Subdrainage System: for perimeter drainage system.

1.4 ABBREVIATIONS

A. HDPE - High-Density Polyethylene.

B. TPO - Thermoplastic Polyolefin.

1.5 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

C. ASTM D 751 Test Method for Coated Fabrics

D. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.

F. ASTM D5295/D5295M - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems; 2014.

G. ASTM D 3767 - Standard Practice for Rubber - Measurements of Dimensions

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

I. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).

J. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

K. UL 790 Tests for Fire Resistance of Roof Covering Materials

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for membrane and joint and crack sealants.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Brewster Central School District's name and registered with manufacturer.

G. Schedule of inspections and inspections reports prepared by the manufacturer. Manufacturer's representative shall perform a minimum of three (3) inspections on the work in progress

1.7 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten (10) years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved in writing by the manufacture.

C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer

D. Regulatory Requirements: Comply with applicable codes, regulations, ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).

E. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing

1. Manufacturer's representative shall be present at meeting.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
2. Protect mastic and adhesive from moisture and potential sources of ignition.
3. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
4. Protect surface conditioner from freezing.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.9 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Construct mock-up consisting of 100 sq ft (10 sq m) of horizontal waterproofed panel; to represent finished work including internal and external corners, seam jointing, drainage panel, and base flashings.

C. Locate where directed.

D. Mock-up may remain as part of work.

1.10 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquid or mastic accessories have cured.

B. Coordinate waterproofing work with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the installation.

C. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear.

D. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post "NO SMOKING" signs.

E. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

1.11 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Upon completion and acceptance of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials for a period of five (5) years.

1. Manufacturer and Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Brewster Central School District.

PART 2 PRODUCTS

2.1 SHEET WATERPROOFING APPLICATIONS

A. Blindside TPO Reinforced Sheet Membrane:

1. Location: Underslab Elevator and Elevator walls below grade and as indicated on the drawings..

B. Self Adhered Rubber Sheet Membrane:

1. Location: Foundation walls below grade as indicated on drawings except where otherwise noted.
2. Vertical Surfaces: Adhesive bonded to substrate.
3. Horizontal Surfaces: Adhesive bonded to substrate.
4. Cover with protection board.

2.2 SHEET WATERPROOFING MATERIALS

A. Self-Adhered Rubber Sheet Membrane:

1. Thickness: 60 mil, 0.060 inch (1.5 mm), minimum.
   a. 56 mils of rubberized asphalt membrane laminated to a 4 mil cross-laminated polyethylene film.
2. Sheet Width: 36 inches (0.914 m), minimum.
3. Tensile Strength:
   a. Film: 5,000 psi (34.57 MPa), minimum, measured in accordance with ASTM D882 and at grip-separation rate of 2 inches (50 mm) per minute.
   b. Membrane: 325 psi (2.24 MPa), minimum, measured in accordance with ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches (50 mm) per minute.
4. Elongation at Break: 350 percent, minimum, measured according to ASTM D412.
5. Water Vapor Permeance: 0.05 perm (2.9 ng/(Pa s sq m)), maximum, measured in accordance with ASTM E96/E96M.
6. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970 at -45degrees F (- mm) , 180 degree bend on 1 inch (25 mm) mandrel.
7. Crack Cycling at -25°F (100 cycles): Unaffected, ASTM C 836
8. Peel Strength: 10 pounds per inch (1750 N/m), minimum, when tested according to ASTM D903.
9. Lap Adhesion Strength: 19 pounds per inch (3327 N/m), minimum, when tested according to ASTM D1876.
10. Puncture Resistance: 60 pounds (27 kg), minimum, measured in accordance with ASTM E154/E154M.
11. Soil Burial 16 weeks: No Effect, GSA-PBS 07121

12. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
13. Hydrostatic Resistance: Resists the weight of 230 feet when tested according to ASTM D5385.

B. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.

C. Products:
1. Carlisle Coatings & Waterproofing Incorporated; MiraDRI 860/861; www.carlisle-ccw.com.
2. Substitutions: See Section 01 2500 Substitution Procedures. .

D. Self-Adhered TPO Sheet Membrane: Composite membrane formed of reinforced TPO sheet with butyl alloy adhesive layer; recommended by manufacturer for direct concrete contact in negative-side waterproofing applications. Provide products as recommended by manufacturer to suit horizontal and vertical applications.
1. Total Sheet Thickness: 70 mil, 0.070 inch (1.77 mm), minimum.
2. Adhesive Thickness: 0.025 inch (0.64 mm), minimum.
3. Field Seaming: Double-sided self-adhesive butyl-based tape.
4. Tensile Strength: 1,500 psi (10.3 MPa) at break, minimum, measured in accordance with ASTM D882.
5. Elongation at Break: 500, measured in accordance with ASTM D412.
6. Water Vapor Permeance:.09 perm (- ng/(Pa s sq m)), maximum, measured in accordance with ASTM E96/E96M.
7. Puncture Resistance: 300 lb (- kg), minimum, measured in accordance with ASTM E154/E154M.
8. Adhesives, Sealants, Tapes, Termination Bars and Accessories: As recommended by membrane manufacturer.
9. Products:
a. Carlisle Coatings & Waterproofing Inc; MiraPLY-H: www.carlisleccw.com/#sle.
b. Carlisle Coatings & Waterproofing Inc; MiraPLY-V: www.carlisleccw.com/#sle.
c. Substitutions: See Section 01 2500 Substitution Procedures..

2.3 ACCESSORIES

A. Primer: As recommended by membrane manufacturer.

B. Mastic: As recommended by membrane manufacturer..

C. Seaming Materials: MiraPly Detail Tape, MiraPly Seam Tape and as recommended by membrane manufacturer.

D. Membrane Sealant: A-1104 Butyl Sealant and As recommended by membrane manufacturer. (

E. Backer Rod: Shall be closed-cell polyethylene foam rod.

F. Termination Bars: Aluminum; compatible with membrane and adhesives.

G. Surface Conditioner: Type, compatible with membrane and recommended by manufacturer for substrate.

H. Adhesives: As recommended by membrane manufacturer.

I. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

J. Protection/Drainage Board: Rigid insulation specified in Section 07 2100.

K. Provide system accessories as per manufacturers recommended installation details including Miradrain fabric on horizontal application

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions are acceptable prior to starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify that items penetrating surfaces to receive waterproofing are securely installed.

D. Do not proceed with work until unsatisfactory conditions have been corrected.

E. Condition of Concrete Surfaces:
   1. The concrete surfaces shall be of sound structural grade and shall have a smooth finish, free of fins, ridges, protrusions, rough spalled areas, loose aggregate, exposed course aggregate, voids or entrained air holes. Rough surfaces shall receive a well-adhered parget coat.
   2. Concrete shall be cured by water curing method. Any curing compounds must be of the pure sodium silicate type and be approved by the Carlisle representative.
   3. Concrete shall be cured at least 7 days and shall be sloped for proper drainage.
   4. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non-shrink grout or ground to match the unrepaired areas.
   5. Surfaces at cold joints shall be on the same plane

3.2 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Cast-In-Place Concrete Substrates:
   1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).
   2. Concrete shall be cured by water curing method. Any curing compounds must be of the pure sodium silicate type or clear resin-based materials without waxes, oils or pigments and be approved by the manufacturer's representative.
   3. Form release agents must not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane.
   4. Concrete/Footing shall be sloped for proper drainage.
   5. Surfaces at cold joints shall be on the same plane. Grind irregular construction joints to suitable flush surface.

E. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

F. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.
   1. All cracks over 1/16" in width and all moving cracks under 1/16" in width shall be routed out to 1/4" minimum in width and depth and filled flush with an approved polyurethane sealant recommended by manufacturer.
   2. Install a 3/4" face, 45 degree cant of polyurethane sealant at all angle changes and inside corners including penetrations through the deck, walls, curbs, etc.
   3. All expansion joints less than 1" wide shall be cleaned, primed, fitted with a backing rod and caulked with polyurethane sealant. For larger joints, contact manufacturer's representative.
   4. Allow all sealant to cure at least overnight.

G. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

H. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate in accordance with ASTM D5295/D5295M.
   1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.

2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in reference standard.
3. Remove and replace areas of defective concrete; see Section 03 3000.
4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in referenced standard.
5. Test concrete surfaces as described in referenced standards, and verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.3 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.

D. Overlap edges and ends, minimum 3 inches (76 mm), seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Seal membrane and flashings to adjoining surfaces.

I. Install self-adhering sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

J. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

K. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

3.4 INSTALLATION - DRAINAGE PANEL

A. Install self-adhering sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward; scribe and cut boards around projections, penetrations, and interruptions.

C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

D. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 3 inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Brewster Central School District will provide testing services, and Contractor to provide temporary construction and materials for testing.

C. Flood to minimum depth of 2 inch (50 mm) with clean water, and after 48 hours inspect for leaks.

3.6 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

B. Vertical Application:

1. Install perimeter drainage System as the first course of drainage composite immediately after membrane has been installed on vertical surfaces. Install protection board Stop drainage board 6" below final grade level.

C. Horizontal Application:

1. Install drainage composite protection immediately after flood testing on horizontal surfaces. If flood testing is delayed, install a temporary covering to protect the membrane from damage by other trades.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

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 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, underside of floor slabs, and over waterproofing.

B. Batt insulation in exterior wall construction.

C. High Performance insulation

D. Batt insulation for interior partitions.

E. Foam sealant for filling exterior perimeter windows, curtain walls, storefronts, doors and trim spaces.

F. Concealed building insulation.

G. Acoustical insulation

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 04 2000 - Unit Masonry. for cavity wall insulation.

C. Section 05 4000 - Cold-Formed Metal Framing: Batt insulation within metal framing and vapor barrier..

D. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.

E. Section 07 2500 - Weather Barriers

F. Section 07 1113 - Bituminous Dampproofing.

G. Section 07 1300 - Sheet Waterproofing

H. Section 07 4213.19 - Insulated Metal Wall Panels

I. Section 07 5419 - PVC Roofing

J. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

K. Section 09 2116 - Gypsum Board Assemblies.

L. Section 09 5100 - Acoustical Ceilings.

1.4 REFERENCE STANDARDS

A. ASTM C 203- Breaking Load and Flexural Properties of Block-Type Thermal Insulation ASTM C 203

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

C. ASTM C272 Water Absorption

D. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission

E. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2017a.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

G. ASTM D 696 Coefficient of Linear Thermal Expansion.

H. ASTM D1621 Compressive Strength.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

J. ASTM E 119 Fire-Resistance Ratings

K. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

L. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.8 WARRANTY

A. Provide manufacturer's written that the actual thermal resistance of the extruded polystyrene insulation will not vary by more than ten (10%) from its published thermal resistance.

1. Warranty Period: 5 years.

PART 2 PRODUCTS

2.1 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.

1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
2. Smoke Developed:165 or less, when tested in accordance with ASTM E84.
3. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
4. R-value (RSI-value); 1 inch (25 mm) of material at 72 degrees F (22 C): 5 (0.88), minimum.
5. Board Size: 24 x 96 inch (610 x 2440 mm).
6. Board Thickness: 1-1/2 inches (37.5 mm).
7. Board Edges: Square.
8. Thermal Resistance: per inch, ASTM C518 @ 75°F R-value 5.0
9. Product: Dow Chemical Co. "Styrofoam".
    a. "Styrofoam Perimate". Use for vertical foundation walls over membrane waterproofing.
    b. "Styrofoam HighLoad 40" . Use for under slabs
    c. "Styrofoam Square Edge" Use for vertical foundation walls, except over membrane water proofing.

2.2 MINERAL FIBER BOARD INSULATION MATERIALS

A. Mineral Wool Block and Board Thermal Insulation: Complying with ASTM C612.
   1. Facing: None, unfaced.
   2. Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
   3. Smoke Developed Index: 50 or less, when tested with facing, if any, in accordance with ASTM E84.
   4. Board Size: 24 by 48 inch (600 by 1200 mm).
   5. Board Thickness: 1" and 1-1/2 inches (25 and 37.5 mm) Provide thicknesses as shown on drawings.
   6. Board Edges: Square.
   7. R-value at 75 deg.: 4.2 per inch
   8. Thermal Conductivity (k-factor): Btu inch/hr sq ft degrees F (W/m K) of 0.26 (0.037) per inch, minimum, at 75 degrees F (24 degrees C) when tested in accordance with ASTM C518.
   9. Maximum Density: 8 lb/cu ft (- kg/cu m). ASTM C303
   10. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   11. Smoke Developed Index: 50, when tested in accordance with ASTM E84.
   12. Products:
      a. ROCKWOOL; COMFORTBOARD 80: www.rockwool.com/#sle.
         a) Locations: Exterior walls as indicated in the drawings.

2.3 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
   1. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   2. Thermal Resistance: R of 4 per inch of thickness (25 mm).
   3. Thickness: 3 1/2 or 6 inches as required to fill stud cavity.
   4. Products:
      a. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
         a) Comfortbatt SS locations: All exterior stud walls.
      b. ROCKWOOL; AFB: www.rockwool.com/#sle.
         a) Locations: All interior stud partitions.
   5. Substitutions: Section 01 2500 Substitution Procedures.

2.4 ACCESSORIES

A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil, 0.010 inch (0.25 mm) thick.

B. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch (50 mm) wide.
   1. Products:

C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

D. Wire or Wire Mesh: Galvanized steel, hexagonal wire mesh. Gauges as required to support insulation.

E. Adhesive: Type recommended by insulation manufacturer for application.

F. Window and Door Joint Seal: Polyurethane-based joint filler:
   1. UL Classified.
   2. Product: "Great Stuff" as manufactured by Dow Chemical.
      a. "Gaps and Cracks: for joints less than 1".
      b. "Big Gap Filler" for joint over 1".

3. Use for all joints around windows and doors located on exterior walls.

G. Sill Sealer: Owens Corning "FoamSealer,
1. Width: As required to provide total coverage under 6" metal stud track.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of irregularities.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Preparation:
1. Surface shall be smooth, monolithic and free of coarse aggregate.
2. Clean off debris from footings.
3. Waterproofing shall be cured and free of solvent.

B. Adhere a 6 inches (152 mm) wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
1. Tape seal joints.
2. Extend sheet full height of joint.

C. Apply adhesive to back of boards:
1. Three continuous beads per board length.
2. Full bed 1/8 inch (3.2 mm) thick.

D. Install boards vertically on foundation perimeter.
1. Place boards to maximize adhesive contact.
2. Be sure shiplap on long edge of panel overlaps previous panel. Continue until a comer is reached.
a. Cut and install comer panels, cutting off shiplap at corner.
3. When additional tiers are required, shiplap edges at both horizontal and vertical joints
4. Seal off top edge of panels below grade to prevent soil entry, using a J or Z channel, sheathing tape, or soil fabric.
a. Protect exposed panels above grade from physical damage and ultraviolet exposure with protection panel, flashing, or latex coating
5. Butt edges and ends tightly to adjacent boards and to protrusions.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION AT EXTERIOR WALLS

A. Adhere 6 inches (152 mm) wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
1. Tape seal joints between sheets.

B. Apply adhesive to back of boards:
1. Three continuous beads per board length.

C. Install boards horizontally on walls.
1. Place boards to maximize adhesive contact.
2. Install in running bond pattern.
3. Butt edges and ends tightly to adjacent boards and protrusions.

D. Extend boards over expansion joints, unbonded to wall on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

D. Place 6 inches (152 mm) wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

3.5 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.6 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Tape insulation batts in place.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

H. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

I. Tape seal tears or cuts in vapor retarder.

J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

K. Coordinate work of this section with requirements for vapor retarder, see Section 07 2600.

3.7 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:

1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

3.8 ACOUSTICAL INSULATION

A. Acoustical Insulation shall be installed as follows:

1. Partitions requiring sound attenuation batts.
2. Friction fit snug against wallboard without gaps between batts. Butt ends of batts together. Install behind electrical outlets, structural obstructions, jambs, sills etc.

3.9 FOAM WINDOW AND DOOR SEAL

A. Fill all exterior joint between windows and doors solid in accordance with manufacture's instructions.

B. Cut back to permit application of joint sealant.

3.10 SILL SEALER

A. Smooth top surface of of wall to provide maximum variation of 1/4".

B. Butt ends and perpendicular joints tightly.

C. Pierce sill sealer thru anchor bolts or reinforcing rods.

D. Anchor sill plate to wall.

3.11 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Air and Vapor Barrier membrane, Fluid-applied.

B. Self Adhering flashing.

C. Fluid applied flashing.

D. Through wall flashing.

E. Joint Tape.

F. Joint Compound.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 04 2000 - Unit Masonry

C. Section 05 4000 - Cold-Formed Metal Framing: Water-resistive barrier

D. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.

E. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

F. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

G. Section 07 9200 - Joint Sealants: Sealing building expansion joints.

H. Section 09 2116 - Gypsum Board Assemblies: Water-resistive barrier

1.4 DEFINITIONS

A. Weather Barriers: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

1.5 REFERENCE STANDARDS

A. ASTM C 1250 - Standard Test Method for Nonvolatile Content of Cold Liquid-Applied Elastomeric Waterproofing Membranes

B. ASTM C 1305 - Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

D. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting

E. ASTM D 2240 - Standard Test Method for Rubber Property - Durometer Hardness.

F. ASTM D 4541 - Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

I. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.

J. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylight, Doors and Curtain Walls by Uniform Static Air Pressure Differences.

K. ASTM E 779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.

L. ASTM E 783 - Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.

M. ASTM E 1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
   1. ASTM E 1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

N. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls

O. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

P. ASTM E 2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

Q. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

R. AATCC Test Method 127 Water Resistance: Hydrostatic Pressure Test.

S. TAPPI Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area).

T. TAPPI Test Method T-460; Air Resistance (Gurley Hill Method)

1.6 QUALITY ASSURANCES

A. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

B. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.

C. Qualifications
   1. Installer shall have experience with installation of weather barrier assemblies under similar conditions.
   2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
   3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer

1.7 PRE-INSTALATION MEETING

A. Refer to Section 01 3000 - Administrative Requirements.

B. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, Engineer, Consultant, Installer, Owner's Representative, and Weather Barrier Manufacturer's Designated Representative.

C. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection

1.8 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch

D. Shop Drawings: Provide drawings of special joint conditions.

E. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

F. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier system installation

1.9 MOCK-UPS

A. Install water-resistive barrier materials in mock-up specified in Section 01 4000.

B. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty

C. Install mock-up using approved weather barrier assembly including fasteners, flashing, and tape and related accessories per manufacturer's current printed instructions and recommendations.

1. Mock-up size: 10' X 10'.
2. Mock-up Substrate: Match wall assembly construction, including window opening.
3. Mock-up may remain as part of the work.

D. Contact manufacturer's designated representative prior to weather barrier system installation, to perform required mock-up visual inspection and analysis as required for warranty

1.10 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store weather barrier materials as recommended by weather barrier manufacturer.

1.12 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of doors, louvers , flashings, sheathing, and wall panel to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation

1.13 WARRANTY

A. Special Warranty

1. Special weather-barrier manufacturer's warranty for weather barrier assembly for a period of ten (10) years from date of final weather barrier installation.
2. Approval by weather barrier manufacturer for warranty is required prior to assembly installation.

PART 2 PRODUCTS

2.1 AIR BARRIER MATERIALS (AIR AND VAPOR BARRIER)

A. Air and Vapor Barrier membrane, Fluid-Applied:

1. Manufacturers: (Basis of Design) :
   a. Hohmann & Barnard, Inc. Hauppauge, NY
      Enviro-Barrier, Elastomeric fluid applied air and vapor barrier.

2. Material:Synthetic polymer elastomeric membrane.
3. Dry Film Thickness (DFT): 40 mils, 0.040 inch (1.016 mm), minimum.(60 mil thickness wet)
4. Air Permeance:.0008 cubic feet per square foot (- L/s/sq m), maximum, when tested in accordance with ASTM E2178.
5. Water Vapor Permeance: 0.050 perms (- ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
6. Water Penetration Resistance: Greater than 1000 cm when tested in accordance with AATCC Test Method 127. No leakage at 15 psf when tested in accordance with ASTM E 331
7. Elongation: 600 percent, minimum, when tested in accordance with ASTM D412.
8. Surface Burning Characteristics: Flame spread index of 25 or less, Class A smoke developed index of 25 or less, when tested in accordance with ASTM E84.
9. VOC Content: FREE .

2.2 SEALANTS

A. Sealant: Elastomeric; non-vapor permeable sealant; compatible with weather barrier.

B. Polyurethane Sealant: as specified in Section 07 9200 - Joint Sealants.

C. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.3 ADHESIVES

A. Provide adhesive recommended by weather barrier manufacturer.

2.4 ACCESSORIES

A. Sealants, Tapes, and Accessories Used for Sealing Water-Resistive Barrier and Adjacent Substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions.

B. Sealants: Refer to Section 07900 Joint Sealants and approved by the weather barrier manufacturer

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

B. Verify that surfaces and conditions comply with requirements of this section.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive air barrier system in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.
   1. General
      a. Apply with heavy duty airless spray equipment. Brush application not permitted.
      b. Single monolithic application.
      c. Approx. 25 sq.ft. per gallon min. coverage rate to achieve 60 mil wet film thickness. Monitor wet film thickness during application. Additional thickness may be required to achieve 40 mil dry thickness. Provide test area which reflects the temperature expected during final application. Adjust wet thickness as required to ensure 40 mil dry film thickness throughout the application. Use a wet film thickness gauge.
      d. Do not apply to damp surfaces.

B. Sheathing:

1. Joints shall be prepared per manufacturer's approved joint treatment details.
2. Apply joint tape as recommended by fluid-applied weather barrier manufacturer.
    a. No joint treatment required for joints up to 1/16 inch.
    b. Joints 1/16 to 1/4 inch: Fluid-applied joint compound applied to form a 1 inch width on each side of sheathing joint; smooth joint compound across sheathing joint. Thickness shall be 15 to 25 mils.
    c. Joints 1/16 to 1/2 inch: Apply joint tape to bridge both sides of joint equally. Apply fluid-applied joint compound and trowel smooth embedding joint compound uniformly into joint tape to form a 1 inch width on each side of sheathing joint at a consistent thickness of 15 to 25 mils.
    d. Joints 1/2 to 1 inch: Apply sheet flashing primer above and below sheathing joint. Center sheet flashing over sheathing joint and press firmly in place per manufacturer's recommendations.

C. Non-movement joints in masonry and transitions to columns and beams:
1. Joints 1/4 inch wide or less: Apply fluid-applied joint compound a minimum of 2 inches wide by 60 mils thick to each side of joint or crack
2. Joints 1/4 to 1/2 inch: Apply joint tape to joint, then apply joint compound to joint 2 inches wide by 60 mils thick OR Apply primer 2 inches on each side of joint. Center sheet flashing over joint and press firmly in place per manufacturer's recommendations.

D. Apply fluid-applied joint compound to cladding anchors prior to installation of weather barrier membrane per manufacturer's instructions.

E. Apply fluid-applied joint compound around penetrations in exterior walls forming a fillet bead minimum ½ inch onto each surface.

F. Liquid Applied Coatings Over Concrete Masonry Units.
1. Prepare substrate in accordance with coating manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
2. Patch all cracks, protrusions, small voids, offsets, details, irregularities and small deformities with manufacturer's recommended patching material. wait two (2) hours before application.
3. Where exterior masonry veneer is being applied, install masonry anchors prior to placement of water-resistive barrier over masonry substrate; seal airtight around anchors.
4. Apply flashing to seal with adjacent construction and to bridge joints in coating substrate.
5. Provide Mock-up to insure proper thickness can be achieved as porous masonry block walls may require additional coats to obtain desired thickness.
6. Maximum UV exposure period for membrane is four months.

G. Allow Fluid-Applied Flashing, Joint Compound and Sealant to cure for minimum 24 hours before coating with Fluid-applied Weather Barrier.

H. Fluid Applied Weather Barrier: Install fluid-applied weather barrier prior to installation of windows, doors and louvers.
1. Mask and protect any adjacent finished surfaces from fluid- applied weather barrier material.
2. Install fluid-applied weather barrier over exterior face of required exterior wall substrates in accordance the manufacturer recommendations and instructions.
3. Install fluid-applied weather barrier by spraying or 3/4" nap-rolling method to achieve 75 mils wet, providing a consistent and uniform thickness. Porous masonry block walls may require additional coats to obtain desired thickness.
4. Repair any voids, holidays, or non-uniform installations or damages by other trades to proper mil thickness prior to installation of final cladding assemblies.
5. Hot weather applications: If the material begins to slump, two coats may be necessary. Apply second coat after first coat has completely dried, approximately one to two hours after first coat.

6. Frequently inspect surface area with a wet mil gauge to ensure consistent thickness.

I. Install fluid-applied weather barrier prior to installation of windows, doors, and louvers.

J. Repair any voids, holidays, or non-uniform installations or damage by other trades to proper mil thickness prior to installation of final cladding assemblies.

K. Curing and Drying: Allow material to dry at air and surface temperatures of 40° F or higher. Curing times will be affected by relative humidity, temperature and airflow.

3.4 FLASHINGS (NON FLANGED WINDOWS)

A. Cut flexible flashing a minimum of 12 inches longer than width of sill rough opening.

B. Cover horizontal sill by aligning flexible flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. Apply 9-inch wide strips of flashing at jambs. Align flashing with interior edge of jamb framing. Start flashing at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install flexible flashing at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instructions and ASTM C1193.

I. Position weather barrier head flap across head flashing. Adhere using flashing over the 45-degree seams.

J. Tape top of window in accordance with manufacturer recommendations.

K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C1193.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Brewster Central School District’s Inspection and Testing: Cooperate with Brewster Central School District’s testing agency.
   1. Allow access to work areas and staging.
   2. Notify Brewster Central School District’s testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
   3. Do not cover work of this section until testing and inspection is accepted.

C. Coordination of ABAA Tests and Inspections:
   1. Provide testing and inspection required by ABAA QAP.
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

D. Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation

E. Obtain approval of installation procedures from water-resistive barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

F. Take digital photographs of each portion of installation prior to covering up weather barriers.

3.6 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 4100
PREFORMED METAL STANDING SEAM ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Factory formed Standing Seam metal roof panels.

B. Metal trim, accessories, fasteners and sealants.

1.2 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashings and Specialties

B. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate roof installation with adjoining work.

B. Preinstallation Meeting: Convene one week before starting work related to installation of roof panel substrate.

1. Require attendance of parties directly effecting work of this section, as follows:
    a. Brewster Central School District representative.
    b. Contractor.

1.5 SUBMITTALS

A. Product Data - Roof system: Manufacturer's data sheets on each product to be used, including:

1. Physical characteristics of components shown on shop drawings.
2. Storage and handling requirements and recommendations.
3. Installation instructions and recommendations.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

C. Samples: Submit two samples of 24" x 24" in size illustrating finish color, sheen, and texture.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Brewster Central School District's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified with minimum three years of documented experience.

1.7 MOCK-UPS

A. Construct mock-up, 6 feet (- m) long by 2 feet (- m) wide; include panel system, attachments to building frame, associated air/water barrier materials, drainage system, sealants and seals, and related wall insulation in mock-up.

B. Locate where directed.

C. Mock-up may remain as part of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather; prevent twisting, bending, or abrasion, and provide ventilation to stored materials; slope metal sheets to ensure drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.9 FIELD CONDITIONS

A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 35 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Brewster Central School District's name and register with warrantor.

C. Special Warranty: Provide 20 year warranty covering water tightness and integrity of seals of roof system. Complete forms in Brewster Central School District's name and register with warrantor.

D. Applicator shall furnish written warranty for a two (2) year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight condition.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Petersen Aluminum Corp. Acworth , GA.
   1. PAC CLAD, Tite-Loc Plus Panel

2.2 PERFORMANCE REQUIREMENTS

A. Roof Panel: Factory fabricated prefinished metal panel system, site assembled.

B. Panels shall be factory-produced only. Mechanically field seam per the manufacturers written instructions. Mechanical equipment and related tools required for seaming shall be supplied only by suppliers, approved in writing, by the manufacturer.
   1. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   2. Design Pressure: In accordance with applicable codes.

C. Roof System shall be designed to meet Standard Building Code Wind Load requirements.

D. Panels to meet:
   1. Water Penetration: When tested per ASTM E-283/1680 and ASTM E-331/1646 there shall be no uncontrolled water penetration or air infiltration through the panel joints.
   2. Roof System shall be designed to meet a UL Class 90 wind uplift in accordance with UL standard 580 and panel system shall be ASTM 1592 Tested and approved
   3. UL 2218 - Impact Resistance rated

2.3 COMPONENTS

A. Roof Panel
   1. Orientation: As indicated on the drawings.; style as indicated.
   2. Joint Layout: As indicated on Drawings.
   3. Material: Aluminum,.040 inch (- mm) minimum thickness.
   4. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to

supports using concealed clips in side laps. Include clips, cleats, pressure plates and accessories required for a weathertight installation.

5. Roof panels shall be standing seam Tite-Loc Plus in 18" widths with 2" high seams that are mechanically seamed together @ 180 degrees.
6. Panels to be produced with Factory supplied hot melt mastic in the seams.
7. Panels to be produced Smooth - Factory Standard.
8.
9. Forming: Use continuous end rolling method. No end laps on panels. No portable rollforming machines will be permitted on this project, no installer-owned or installer-rented machines will be permitted. It is the intent of the Architect to provide Factory-Manufactured panel systems only for this project.
10. Panel Width: 18 inches (- mm).between standing seams.

2.4 MATERIALS

A. Aluminum Plate: ASTM B209/B209M, 3003 alloy, H14 temper.
   1. Surface Texture: Smooth.

2.5 FINISHES

A. Color shall be Pac-Clad Metallic Finish, as selected by Architect from manufacturers complete line.

B. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over a 0.25 to 0.3 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil, to meet AAMA 621. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesions, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.

C. If Strippable coating to be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and handling, film shall be removed before installation.

D. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.

E. Closures: use composition or metal profiled closures at the top of each elevation to close ends of the panels. Metal closures to be made in the same material and finish as face sheet.

F. Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates.

G. Substrate shall be as indicated on drawing details.

H. Roofing Underlayment
   1. On all surfaces to be covered with roofing material, furnish and install a 40 mil "Peel & Stick membrane", required as outlined by metal panel manufacturer. Membrane to be a minimum of 40 mil thickness, smooth, non-granular, by one of the following manufacturers:
      a. W.R Grace "Ice & water Shield"
      b. Carlisle CCW WIP 300HT
   2. Underlayment shall be laid in horizontal layers with joints lapped toward the eaves a minimum of 6", and well secured along laps and at ends as necessary to properly hold the felt in place. All underlayment shall be preserved unbroken and whole.
   3. Ice and Water Shield shall lap all hips and ridges at least 12" to form double thickness and shall be lapped 6" over the metal of any valley or built-in gutters and shall be installed as required by the Standing Seam Panel Manufacturer to attain the desired 20 Year Weathertightness Warranty.

I. Sealants
   1. Provide two-part polysulfide class B non-sag type for vertical and horizontal joints or

one part polysulfide not containing pitch or phenolic extenders or

Exterior grade silicone sealant recommended by roofing manufacturer or

One part non-sag, gun grade exterior type polyurethane recommended by the roofing manufacturer.

2.6 ACCESSORIES

A. Fasteners: Manufacturer's standard type to suit application; .

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate framing members are ready to receive panels.

3.2 INSTALLATION

A. Install panels on roof in accordance with manufacturer's instructions and approved shop drawings.

B. Fasten panels to substrate structural supports; aligned, level, and plumb.

C. Locate joints over supports, and lap panel ends minimum 2 inches (51 mm).

D. Provide expansion and control joints where indicated.

E. Seal and place gaskets to prevent weather penetration; maintain neat appearance.

F. Panels to be designed for attachment with concealed fastener clips, spaced as required by the manufacturer to provide for both positive and negative design loads, while allowing for the expansion and contraction of the entire roof system resulting from variations in temperature.

3.3 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch (1.6 mm).

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch (3.2 mm).

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Do not cover installed air/water barriers until required inspections have been completed.

C. Obtain approval of installation procedures by air/water barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.5 CLEANING

A. See Section 01 7000 - Execution for additional requirements.

B. Remove protective material from panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 07 4213
ALUMINUM SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. The extent of aluminum soffit shown on the drawings.

B. Manufactured metal aluminum panels for exterior soffits, with accessory components

C. Accessories, fasteners, and sealants.

1.3 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications.

B. Section 06 1000 - Rough Carpentry.

C. Section 07 9200 - Joint Sealants.

1.4 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. ASTM E-330 Structural Performance Tested.

E. New York State Building Code.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's standard printed product data and installation instructions for specified products.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details and methods of anchorage, and thickness, dimension, components of parts and installation instructions.

D. Samples: Submit two samples of soffit panel, 12 inch by 12 inch (305 mm by 305 mm) in size illustrating finish color, sheen, and texture.

E. Affidavit certifying materials meet all requirements as specified.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum Twenty (20) years of documented experience.

B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience and approved by manufacturer.

C. Soffit System shall be designed to meet applicable New York State Building Code and the System shall have tested by the Manufacturer per ASTM E-1592 and have the applicable Load Tables published from this testing for loads.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap and in accordance with panel manufacturer's recommendations.

B. Store material off the ground, in original packaging and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace standing seam metal roof panels that show evidence of deterioration of factory-applied finish within specified warranty period.
   1. Exposed Panels Finish - deterioration includes the following:
      a. Cracking, checking, peeling or failure of a paint to adhere to a bare metal
   2. Warranty Period: 30 non pro-rated Years from the date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: PAC-Clad Flush panel as manufactured by: Petersen. Aluminum Corporation, 1005 Tonne Road, Elk Grove Village, Il 60007

2.2 ALUMINUM SOFFIT PANELS

A. Aluminum Soffit Panels:
   1. Style: 7" wide Flush Panels
      a. Thickness: Nominal 0.040; aluminum alloy 3105-H14:

2.3 FINISHES

A. Custom Fluoropolymer Coating System: Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness (DFT) of 0.9 mil (0.023 mm); color and gloss as selected from manufacturer’s standard line and Premium line and Wood grain.s

2.4 ACCESSORIES

A. Accessories: Flashings and Trim Aluminum of same thickness, finish, and color as soffit.
   1. Provide "J" channel color to match soffit.

2.5 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practicable lengths.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate conditions before beginning installation of soffit products; verify dimensions and acceptability of substrate.
   1. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work

B. Examine alignment of structural steel, framing and related supports, primary and secondary roof framing, solid roof sheathing, prior to installation. Components should comply with shop drawings and be smooth, even, sound and free of depressions.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation. Conform to standards set forth in SMACNA architectural sheet metal manuals and approved shop drawings for this project.

B. Remove all strippable coating and provide a dry-wipe down cleaning of the panels as they are erected.

C. Install panel system so it is watertight, without waves, warps, buckles or distortions, and allow for thermal movement considerations.

D. Abrasive devices shall not be used to cut on or near soffitpanel system.

E. Fasten panels to structural supports; aligned, level, and plumb.

F. Use concealed fasteners unless otherwise approved by Architect

G. Secure units to supports.

H. Place fasteners as indicated in manufacturer's standards.

I. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.3 ADJUSTING AND CLEANING

A. Clean dirt from surface of installed products, using mild soap and water.

B. After completing installation, remove from project site excess materials and debris resulting from installation.

END OF SECTION

SECTION 07 4213.19
INSULATED METAL WALL PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Factory-assembled Laminated steel metal panel system for walls and fascia, with trim, related flashings and accessory components.

B. Accessories including fasteners and perimeter trim.

1.3 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals.

B. Section 01 4000 - Quality Requirements Testing Agency Qualifications.

C. Section 05 4000 - Cold-Formed Metal Framing.

D. Section 07 2100 - Thermal Insulation.

E. Section 07 2500 - Weather Barriers Air barrier materials.

F. Section 07 5419 - PVC Roofing

G. Section 07 9200 - Joint Sealers.

H. Section 09 2116 - Gypsum Board Assemblies

1.4 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtainwalls and Sloped Glazing Systems.

B. AAMA 508-07 Voluntary Test Method and Specifications for Pressure Equalized Rain Screen Wall Cladding Systems.

C. AAMA 621 - Voluntary Specification for High Performance Organic coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.

D. SMACNA - Architectural Sheet Metal Manual

E. ANSI/FMG 4881 Standard for Evaluating Class 1 Exterior Wall Assemblies.

F. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

H. ASTM A755: Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products

I. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

J. ASTM C 645 - Specification for Nonstructural Steel Framing Members.

K. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw

L. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.

M. ASTM D 968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.

N. ASTM D 4585 - Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.

O. ASTM D 4587 - Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings

P. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

Q. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

R. ASTM E 119 - Test Methods for Fire Tests of Building Construction and Materials.

S. 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.

T. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

U. ASTM E 1886 – Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

V. ASTM E 1996 - Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

W. ASTM G154: Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.

X. UL 263 - Fire Tests of Building Construction and Materials.

Y. UL 1040 - Fire Test of Insulated Wall Construction.

Z. UL 1715 – Fire Test of Interior Finish Material

AA. National Fire Protection Association (NFPA)

AB. NFPA 259: Standard Test Method for Potential Heat of Building Materials

1.5 PREINSTALLATION MEETING

A. Preinstallation Meeting: Convene one week before starting work site, attended by Architect and Construction Manager, manufacturer's technical representative, and other trade contractors of this section.
   1. Coordinate penetrations and other openings and penetrations of composite wall panel system.
   2. Coordinate building framing in relation to composite wall panel system.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer documentation on tested structural, thermal, and fire resistance capabilities of assembled panel.

C. Shop Drawings: Submit detailed drawings showing:
   1. Profile
   2. Gauge of face sheet
   3. Location, layout and dimensions of panels
   4. Location and type of fasteners.
   5. Indicate points of supporting structure that must coordinate with composite wall panel system installation
   6. Shape and method of attachment of all trim
   7. Locations and type of sealants
   8. Installation sequence
   9. Coordination Drawings: Provide elevation drawings and building sections which show panels in relationship to required locations for structural support. Include panel details and details showing attachment to structural support.
   10. Other details as may be required for a weathertight installation

D. Samples: Submit two samples of panel, 24 x 24 inch (____by____ mm) in size illustrating finish color, sheen, and texture.

E. Design and Performance Data: Indicate panel profile and dimensions, structural properties, and panel calculations to verify panels will withstand the design wind loads indicated without detrimental effects or deflection exceeding the specified limit. Include resistance to fastener pullout.

F. Manufacturer's Installation Instructions: Indicate special handling criteria.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Letter of Compliance: Indicating compliance of products tested from a qualified independent testing agency.

J. Manufacturer's warranty: Submit sample warranty.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum ten years documented experience.

B. Manufacturer/Source: Provide metal wall panel system and panel accessories from a single manufacturer.

C. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years experience and approved by the manufacturer.

D. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with requirements.

E. Manufacturer Erection Instructions: Provide manufacturer’s written installation instructions including proper material storage, material handling, and maintenance instructions.

F. Design calculations and related structural information shall be performed by engineer licensed in the State of New York.

1.8 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

B. Air Infiltration: Maximum 0.06 cfm/sq. ft. (0.3 L/s per sq. m) per ASTM E 283 at a static-air pressure difference of 6.24 lb./sq. ft. (300 Pa), using minimum 10-by-10-foot (3050-by-3050 mm) test panel that includes horizontal and vertical joints.

C. Water Penetration, Static Pressure: No uncontrolled water penetration per ASTM E 331 at a minimum static differential pressure of 15 lb. /sq. ft. (718 Pa), using minimum 10-by-10-foot (3050-by-3050 mm) test panel that includes either horizontal or vertical joints.

D. Water Penetration, Static Pressure – 2-hour duration: Panel system shall demonstrate no water penetration when tested in accordance with ASTM E331 at 15 psf pressure differential for a two (2) hour duration to satisfy International Building Code, Section 1403.2. Panel systems unable to demonstrate compliance with this requirement will require a separate weather-resistive barrier, approved by CENTRIA for fire performance, installed behind the wall panel system to comply with International Building Code requirements.

E. Water Penetration, Dynamic Pressure: No uncontrolled water penetration per AAMA 501.1 at a minimum static differential pressure of 15 lb/sq. ft. (718 Pa), using minimum 8-by-8-foot (3050by-3050 mm) test panel that includes horizontal and vertical joints. For panels installed horizontally only.

F. System Performance: A 3rd party test report utilizing the standard ASTM E 283, E 331 and AAMA 501 procedures following the test protocol described in AAMA 508-07 must be submitted prior to bid. Test panel must include a horizontal joint, with an imperfect air barrier. For panels installed horizontally only.

1. Manufacturer supplying panel systems that have not successfully passed AAMA 508-07 shall provide a backup system that meets the air and water infiltration values as listed above in sections 1.8.B – 1.5.E.

G. Water Absorption: Maximum 1.0 percent absorption rate by volume when tested according to ASTM C 209.

H. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, per ASTM E 72:
1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
2. Limits of Deflection: Composite wall panel system shall withstand scheduled wind pressure with the following allowable deflection:
a. Maximum allowable deflection limited to L/180 deflection of panel perimeter normal to plane of wall with no evidence of failure.
3. Secondary Metal Framing: Design secondary metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions." Refer to Section 05 4000 - Cold-Formed Metal Framing.
a. Backer Flash & IMV - Provide a minimum 5-inch (127mm) wide bearing surface for metal wall panels at the following locations
a) Horizontal Panel System: At typ.. 5/8” vertical joints.
b) Vertical Panel System: 4-1/2” at horizontal stack joints.
b. Backer Flash & Gasket - Provide minimum bearing surface for metal wall panels at the following locations:
a) Horizontal Panel System: 3” wide at vertical joints.
c. Seal Plate & IMV and Gasket - Provide minimum 6-inch- (152-mm-) wide bearing surface for metal wall panels at the following locations:
d. Horizontal Panel System: At vertical joints.
4. Windborne-Debris-Impact-Resistance Performance: Pass missile-impact and cyclic-pressure tests per ASTM E 1886 and ASTM E 1996 for Wind Zone indicated on Drawings.

I. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

J. Thermal Performance: Thermal-resistance (R) value indicated, based on ASTM C 1363 and maintained ASTM C 518 testing and finite element modeling, with the following conditions:
1. 15 mph (24.1 km/h) exterior wind speed and still air on interior.
2. Include side joint and standard fastening.
3. Base R value reported on performance of specified panel, taking into account integral reveals and profiling with resultant reduction in panel insulation thickness.

K. Fire Performance Characteristics: Provide metal composite wall systems that comply with the performance requirements of Chapter 26 Plastic of the 2015 International Building Code.
1. Fire Performance of Insulated Wall: Third Party Design Listing CSG/GWP 30-03.
2. Fire Performance of Insulated Wall: Class 1 Wall Panel per ANSI/FM 4880, 4881 & 4882.

1.9 MOCK-UPS

A. Construct mock-up, 8 feet (2.5 m) long by 8 feet (2.5 m) wide, including panels, joints, attachments to building frame, related insulation, and related insulation.

B. Demonstrate component assembly including panel materials, weep drainage system, attachments, anchors, and perimeter sealant.

C. Locate where directed.

D. Mock-up may remain as part of work.

E. Approval of mockup does not relieve Contractor of responsibility to comply with all requirements of contract documents.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

1.11 FIELD CONDITIONS

A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.12 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Special Manufacturer’s Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace metal wall panel assemblies that fail in materials and workmanship within [two] years from date of Substantial Completion.

C. Special Panel Finish Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace wall panels that display evidence of deterioration of finish within 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Insulated Metal Wall Panels:
   1. CENTRIA, Formawall Dimension Series Insulated Core Metal Wall Panels.
      a. Centria, a Nucor Company; Architectural Systems; Moon Township, PA 15108-2944. Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317. Email: info@CENTRIA.com..
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 COMPONENTS

A. Wall Panels: Exterior and interior metal sheet skin, factory-assembled, with foamed in place insulation; exterior and interior sheet interlocking at edges, fitted with continuous gaskets.
   1. Panel Width: As indicated on drawings.
   2. Profile: As indicated; horizontal panels.
   3. Panel Thickness: 2 inch (1-1/8 mm).
   4. Panel joint shall consist of fasteners completely concealed within the joint. Panel joint shall have a continuous finned rubber gasket seal for defense against water infiltration.
   5. Metallic-Coated Steel Face Sheet: Coil-coated, ASTM A 755/A 755M.
      a. Exterior Sheet: Pre-finished galvanized steel, 20 gauge, 0.0359 inch (0.91 mm) minimum base metal thickness.
   6. Profile:
      a. Flat profile to have no flutes, planking, or mild profiling of any type.
      b. Texture: Smooth.
   7. Exterior Paint Finish Color:
      a. 2.4 mil. Fluoropolymer (PVDF) Three Coat system: 0.8 mil primer with 0.8 mil Kynar 500 (70 percent) SOLID color coat and 0.8 mil clear coat.
         a) Basis of Design: CENTRIA Duragard.
         b) Color: As selected by Architect from manufacturer's standard colors and Premium colors..

8. Interior Sheet: Galvanized steel, pre-finished, 22 gauge, 0.0299 inch (0.76 mm) minimum base metal thickness.

2.3 ACCESSORIES

A. General: Provide complete metal wall panel assembly incorporating trim, copings, fascia, parapet caps, soffits, sills, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, gaskets, lap tapes, closure strips, and caps for a complete installation. Fabricate accessories in accordance with SMACNA Manual.

B. Sealants at exposed joints: Elastomeric polyurethane Neutral cure silicone sealant compliant with ASTM C920.

C. Fasteners: Fasteners aluminum or stainless steel as recommended by manufacturer.

D. Perimeter Trim:

1. Fabricated perimeter trim and metal flashing: Shall be same gauge, material and coating color as exterior face of insulated metal wall panel.

E. Fasteners: Manufacturer's standard type to suit application; hot-dip galvanized steel with soft neoprene washers; provide with fastener cap same color as exterior panel.

F. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine metal wall panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.

B. Wall Substrate: Confirm that wall substrate is within tolerances acceptable to metal wall panel system manufacturer.

C. Maximum deviations acceptable:

1. 1/4-inch in 20 feet (6.4 mm in 6 m) vertically or horizontally from face plane of framing.
2. 1/2-inch (12.7 mm) from flat substrate on any building elevation.
3. 1/8-inch in 5 feet (3.2 mm in 1.5 m).
4. Framing: Inspect framing that will support metal wall panels to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal wall panels.
5. Advise Construction Manager in writing, of all out-of-tolerance work and other deficient conditions prior to proceeding with metal wall panel installation.
6. Correct out of tolerance work and other deficient conditions prior to proceeding with panel installation.

3.2 PREPARATION

A. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

B. Secondary Metal Framing: Install secondary metal framing components as indicated. Install secondary metal framing and other metal panel supports per ASTM C 754 and metal wall panel manufacturer's recommendations.

3.3 INSTALLATION

A. Install panel system on walls and soffits in accordance with manufacturer's instructions.

B. General: Install metal wall panel system in accordance with approved shop drawings and manufacturer's recommendations. Install metal wall panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement

C. Protect panel surfaces in contact with cementitious materials with bituminous paint; allow paint to dry prior to installation.

D. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.

E. Locate panel joints over supports.

F. Fasteners for Steel Wall Panels: Stainless-steel for exterior locations and locations exposed to moisture; carbon steel for interior use only.

G. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as approved by manufacturer.

H. Fasten metal wall panels to supports with concealed clips at each joint at location, spacing, and with fasteners recommended by manufacturer and shown on drawings. Install clips to supports with self-tapping fasteners.

I. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

J. Horizontal Application:
   1. Horizontal Joinery: Working from base of installation to top connect upper panel to lower panel at dry seal joinery.
   2. Vertical Joinery: Provide reveal between vertical ends of panels as shown on shop drawings using IMV and/or gasket furnished by manufacturer to form a weather tight seal between panels.

K. Use concealed fasteners unless otherwise approved by Architect.

L. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

M. Install panels plumb, level, and true-to-line to dimensions and layout indicated on approved shop drawings.

N. Cut panels prior to installing, where indicated on shop drawings, using a power circular saw with fine tooth carbide tip blade per manufacturer’s instructions. Personnel should wear respiratory and eye protection devices.

O. Place panel fasteners through leading edge face metal, concealed within the joint of the panel. Secure units to the structural supports. Space fasteners as recommended by manufacturer or otherwise indicated on the approved shop drawings.

P. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies.

Q. Seal metal wall panel to supports or back-up flashing sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer. Do not install sealant in locations that will interfere with drainage of pressure-equalized panel chambers.

R. Prepare joints and apply sealants per Division 07 Section "Joint Sealants.

3.4 ACCESSORY INSTALLATION

A. General: Install metal wall panel accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install related flashings and sheet metal trim per requirements of Division 07 Section 076200 - Sheet Metal Flashings and Specialties.
   2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
   3. Comply with performance requirements and manufacturer's written installation instructions.
   4. Provide concealed fasteners except where noted on approved shop drawings.
   5. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.5 TOLERANCES

3.6 FIELD QUALITY CONTROL

A. The panel installer shall water test panel areas for each crew at least twice during installation schedule and once at the conclusion of the installation.

B. Progress or check tests can be performed by the installer following test procedures noted in AAMA 501.2. No independent test agency need to be employed in this test phase. Results of this test phase is to be recorded and reported to the panel manufacturer and Construction Manager.

C. Final AAMA 501.2 testing will be conducted by an independent test agency following project completion. Areas of test are to be determined by the Architect, Construction Manager, and Contractor and the panel installer. Engagement of the test agency is the responsibility of the Contractor. A field representative from the panel manufacturer is required for the final inspection and testing.

3.7 CLEANING

A. See Section 01 7000 - Execution for additional requirements.

B. Remove site cuttings from finish surfaces.

C. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.

D. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

E. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.8 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 07 5010
MODIFICATIONS TO EXISTING ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Existing Roof is under warranty.
   1. Contractor must notify and be authorized by the manufacturer to perform all work as per the manufacturer's instruction.

B. Remove all existing roofing and flashings as required to provide new openings for mechanical equipment as shown on drawings.

C. Cut new openings and install curbs.

D. Fill in abandoned equipment openings.

E. Install new poly isocyanurate insulation and crickets, a cover board, and fully adhered 60 mil thick fire rated PVC roofing and flashings as indicated or required.

F. Clean all residual material from substrate surfaces and the flutes of any exposed steel deck - prior to installing new insulation and roofing. Install new insulation, roofing and flashings only on dry smooth surfaces.

G. Provide any hoisting and other work needed, and remove, adjust, modify, reset and reconnect all roof-mounted and roof-penetrating devices to enable new roofing and flashings to be installed as shown. Coordinate with mechanical and electrical primes.

H. Roof top mechanical equipment work is specified else-where. Coordinate with the mechanical contractors to set new curbs and equipment, and make modifications to the existing curbs and equipment; then install new roof flashings as indicated.

I. Abandoned mechanical equipment and support curbs will be removed by the mechanical contractors.

J. Refasten any loose sections of the existing metal deck with self drilling screws. as Base Bid work.

K. Maintain building watertight at all times.

L. Comply with the published recommendations and instructions of the roofing membrane manufacturer.

M. Commencement of work by General Contractor shall constitute acknowledgement by Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.3 RELATED REQUIREMENTS

A. Section 061010 - Roof Related Rough Carpentry Wood nailers associated with roofing and roof insulation.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.

C. Section 07 7100 - Roof Specialties: Manufactured copings, fascias, gravel stops, and other flashing-related items.

D. Section 07 7200 - Roof Accessories: Roof hatches, vents, and manufactured curbs.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 for definition of terms related to roofing work not otherwise defined in the section.

1.5 REFERENCE STANDARDS

A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

B. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing; 2016.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2016.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Before start of roofing work, General Cconstruction Contractor, HVAC Contractor, and Roofing Contractor shall hold a meeting to discuss the proper installation of materials, status of the existing warranty, requirements to maintain the existing warranty, and manufacturer's approval of the installer and requirements to maintain the existing warranty..

1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
2. Notify Owner's Representative well in advance of meeting.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:

1. Provide manufacturer's printed data sufficient to show that all components of roofing systems, including insulation and fasteners, comply with the specified requirements and with the roofing manufacturer's requirements and recommendations for the system type specified; include at least the following:.
   a. Technical data sheet for roof membrane.
   b. Technical data sheets for PVC adhesive.
   c. Technical data sheet for fasteners and insulation plates.
   d. Technical data sheet for flashings.
   e. Technical data sheet for aluminum tape.
   f. Technical data sheet for solvent cleaner.
   g. Technical data sheet for each type of metal edging.
   h. Technical data sheet for pavers.
   i. Technical data sheet for each coverboard type.
2. Where the existing roofing system is UL or FM approved provide documentation that shows that the modification installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
3. Pre-Work Site and Building Inspection Report with photos to documents conditions before commencing work.
4. Written certification from the manufacturer which states that the installer is acceptable or licensed to install the specified roofing; if not previously provided.

C. Specimen Warranty: Submit manufacturer's certification that work installed will maintain the existing warranty prior to starting work.

D. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications for all systems under warranty.

E. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice has been accepted and approved by the manufacturer.

F. Executed Warranty.

G. Provide all technical submittals required for this section together in a single submittal. Submittal shall be prepared by firm doing the work.

1.8 CODE APPROVAL REQUIREMENTS

A. Install roofing and insulation system components to meet the following minimum requirements:
   1. New York State Uniform Fire Prevention and Building Code, which includes by reference the New York State Energy Conservation Code.
   2. Underwriters Laboratories Inc. Class A External Fire Rating for roof assemblies tested in accordance with ASTM E 108 or UL 790.
   3. Underwriters Laboratories Inc. Standard 1256 for roof assemblies with foam insulation.
   4. Minimum wind uplift pressure calculated using ASCE 7 and a safety factor of 2:
      a. Field Zone - 90 psf
      b. Perimeter Zones - 135 psf
      c. Corner Zone - 180 psf

B. Provide written certification from the roof material Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Roofing installer shall have the following:
   1. A firm (Installer) with not less than 5 continuous years experience performing PVC roofing work similar to that required for this project, employing personnel skilled in the specified work.
      a. The Installer shall directly employ the personnel performing the work of this section.
      b. The Installer shall have a full time supervisor/foreman on the roof when roofing work is in progress. The Supervisor shall have a minimum of 5 years experience in roofing work similar in nature and scope to this project, and speak fluent English.
      c. The Installer shall provide a reference list of at least three projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:
         a) The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
         b) The Installer shall provide the reference list prior to contract award if requested.
      d. The Installer shall be acceptable to or licensed by the Manufacturer of the primary roofing materials, and provide written certification from the Manufacturer to confirm this prior to award if requested.

B. Material Quality: Obtain each product, including the insulation, cover board, PVC roofing and flashing, and cements, primers and adhesives produced by a single Manufacturer, which has manufactured the same products in the United States of America for not less than 5 continuous years.

C. Pre-Work Conference: Meet at the project site approximately one week prior to starting roof work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
   1. How the building will be kept watertight as old roofing is removed and the work progresses.
   2. How new roofing work will be coordinated with mechanical equipment work, replacement of deteriorated existing insulation and the installation of new insulation, cover board, flashings and other items to provide a watertight installation.
   3. Generally accepted industry practice, the Manufacturer's instructions for handling and installing his products, and project specific work requirements.
   4. The condition of the substrate (deck), curbs, penetrations and preparatory work needed by trades other than the roofer.
   5. Submittals, if any remain incomplete.
   6. The construction schedule, weather forecast for the work period, availability of materials, personnel, equipment and facilities needed to proceed and complete the work in an expeditious manner and on schedule.

7. A schedule for Manufacturer and Architect inspections.

1.10 JOB CONDITIONS (CAUTIONS & WARNINGS)

A. Do not use oil base or plastic roof cement with PVC roofing. Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose PVC roofing and accessories to a temperature in excess of 175 degrees Fahrenheit.

B. Splice cleaner, primer, cements and bonding adhesives are flammable. Do not breathe vapors or use near fire or flame or in a confined or unventilated area. Dispense only from a UL listed or approved safety can.

C. Remove empty adhesive and solvent containers and contaminated rags from the roof and legally dispose of them daily.

D. Do not apply adhesives adjacent to open ventilation system louvers, or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent adhesive odors from entering the building. Remove temporary covers at the end of each days work.

1.11 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packaging, bearing labels which identify the type and names of the products and Manufacturers, with the labels intact and legible.

B. Cover all stored materials, except rolls of PVC and sealed cans of adhesives, with watertight tarpaulins installed immediately upon delivery.

C. Immediately remove any insulation which gets wet from the job site.

D. Do not overload the structure when storing materials on the roof.

E. Store and install all material within the Manufacturer's recommended temperature range.

1.12 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Existing Roof System Under Warranty

1. The existing roofing system is are under warranty and the General Construction Contractor or Roofing Contractor must notify and be authorized by the manufacturer to perform all work as per the manufacturer's instruction.
    a. Manufacture's Warranty: Certification from manufacturer that the existing warranty covering membrane, roof insulation, and other indicated components of the system, shall remain the new and existing terms of the original warranty.
    b.
2. Manufacture's Warranty: Certification from manufacturer that the existing warranty covering membrane, roof insulation, and other indicated components of the system, shall remain the new and existing terms of the original warranty Contractors warranty.
3. Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.

C. Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.

D. Guarantees/Warranties shall include the removal and replacement of items or materials superimposed over the PVC as part of the original work, if removal is needed to make warranty repairs.

E. Guarantee/Warranty coverage may be cancelled, for the affected portion of the roof, if the work is damaged by winds in excess of 72 mph, by hail, lightning, insects or animals, by failure of the structural substrate, by exposure to harmful chemicals, by other trades on the roof, or by vandalism, or if the Owner fails to maintain the roof in accordance with, or makes roof alterations contrary to, the Manufacturer's printed recommendations.

1. Guarantee/Warranty coverage shall be reinstated, for the remainder of the original period; if the Owner restores the roof to the condition it was in prior to the damage occurring.

F. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.

PART 2 PRODUCTS

2.1 GENERAL

A. Acceptable Manufacturer - Roofing System: Match existing manufacturers roofing system.
1. Roofing systems by other manufacturers are not acceptable if existing roof is under warranty.

B. Substitutions: See Section 01 2500 - Substitution Procedures

2.2 PVC MEMBRANE

A. PVC: 60 mils thick, plus or minus 2 mils maximum, fire retardant, fiberglass reinforced, PVC (polyvinyl chloride) G410 lacquer coated sheetmembrane conforming to the following minimum physical properties:

1. Properties ASTM Test Method Minimum Property Fiberglass Reinforcing Material
2. Overall Thickness, inches D638 0.060
3. Tensile Strength, min., psi D638 1500
4. Elongation at Break,
5. (machine x transverse) D638 250% X 230% Seam strength, % of tensile strength) D638 75
6. Properties after Heat Aging per D3045 - Tensile Strength, % of original D638 90
7. Elongation, % of original D751 90
   a. Tearing Resistance, lbf D1004 10
   b. Low Temperature Bend @ -40ºF D136 Pass Accelerated Weather, Xenon Arc D2565 5,000 Hrs
   c. Cracking @ 7x magnification None
   d. Discoloration by observation Negligible
   e. Crazing @ 7 x magnification None Linear Dimensional Change, max. D1204 0.10% Weight Change Immersion in Water D570 ± 3.0% Static Puncture Resistance, 33 lbf D5602 Pass
   f. Dynamic Puncture Resistance, 7.3 ft-lbf D5635 Pass Fire Rating UL Class A
   g. Color: white

2.3 INSULATION:

A. Isocyanurate – Tapered rigid cellular polyisocyanurate boards with fibrous felt/fiberglass mat facers to match existing.

2.4 ACCESSORY MATERIALS

A. Cleaners, adhesives, sealants, caulking and fasteners furnished by the PVC system Manufacturer and as listed below. Use low VOC products as required by regulations in effect at the time of application.

B. Wall and Curb Flashing: G410 fiberglass reinforced PVC, color to match the color of the roof

C. Pitch Pocket Filler: Two component urethane sealant.

D. Corners: Prefabricated outside and inside flashing corners factory formed of 60 mil thick unreinforced PVC, color to match the color of the roof.

E. Sealant: One component acrylic-based resin blended with solvent and inorganic adhesives.

F. PVC Adhesive: Solvent-based reactivating-type adhesive, Sarnacol 2170.

G. Insulation Plates: 3 inch square, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating.

H. Fasteners: #14 corrosion-resistant screws.

I. Aluminum Tape:2 inch wide pressure-sensitive aluminum tape.

J. Solvent Cleaner: One component liquid for the general cleaning of residual asphalt, scuff marks, etc., from the membrane surface and to clean seam areas prior to hot-air welding.

K. Walkway Pads: JM PVC Heavy-duty 150 mil thick, textured, reinforced, fully adhered, walkway pad. Prepare and install per manufacturers written instructions.

L. Insulation adhesive: Two component low rise elastomeric foam adhesive, installed with a mixing extruding dispenser (a Pace Cart or Heated Pleural Extruding Spray Rig) intended for application at the temperatures that will be encountered.

M. Gypsum Cover Board: Fire resistant gypsum board decking with inorganic glass mat facers and a water resistant core, formulated in 48 x 96 inch square edge boards, UL Class A, meeting ASTM C-1177. Dens-Deck Prime or equal. (Match existing thicknesses.)

N. PVC roof membrane: Minimum .060 inches thick, fire retardant, fiberglass reinforced, PVC (polyvinyl chloride) G410 lacquer coated sheet membrane as recommended by the manufacturer.

O. Sealant: One component acrylic-based resin blended with solvent and inorganic adhesives

P. PVC flashing: G410 fiberglass reinforced PVC, color to match the color of the roof.

Q. Fasteners: #14 corrosion-resistant screws.

R. PVC Adhesive: Solvent-based reactivating-type adhesive.

S. Aluminum Tape: 2 inch wide pressure-sensitive aluminum tape

T. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood

U. Cant Strips and Tapered Edge Strips: 45 degree face slope and minimum 5 inch (127 mm) face dimension; provide at all angle changes between vertical and horizontal planes that exceed 45 degrees.

V. Concrete Pavers: Interlocking, with shiplap edges on all sides and integral radiused bearing pads.
   1. Size: Approximately 30 inches (750 mm) by 30 inches (750 mm) by 1-1/2 inches (38 mm) thick.

PART 3 INSTALLATION

3.1 GENERAL

A. Construct the new roofing system in a watertight, workmanlike manner, meeting the guarantee requirements specified herein; in strict accordance with the drawings and in conformance with the Manufacturer's requirements, except as enhanced in this specification.

B. Perform work at areas with roof mounted mechanical equipment, so the work coincides with equipment shutdown periods and does not affect building occupants. Temporarily cover and protect equipment openings, and windows adjoining the work area, with 6 mil fire retardant polyethylene, so dirt, dust and odors do not enter the equipment or building. Remove covers at the end of each workday, and as soon as roof work is complete.

C. Clean the surface on which roofing system components will be applied, of all laitance, dirt, oil, grease or other foreign matter which would in any way affect the quality of the installation.

D. Install roof system components on dry surfaces only. Do not install any items when weather conditions and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.

E. Complete all work in sequence as quickly as possible so that as small an area as practicable is in the process of construction at any one time. Complete the entire area of work begun each day, the same day, and make all exposed edges watertight at the end of each day's work.

3.2 SUBSTRATE INSPECTION

A. Remove portions of existing roofing, insulation, and flashings, and carefully check the existing deck and new roof substrate. To be an acceptable surface for the new roofing system, the deck and substrate shall be well secured to the underlying structure, dry and not otherwise deteriorated.

B. Immediately notify the Architect and Owner by telephone and in writing if defects in the substrate are discovered.

C. Maintain the building watertight in the interim, but do not install new insulation or roofing until substrate defects have been corrected.

3.3 NEW TO EXISTING INTERFACE

A. Remove and replace portions of existing roofing at the construction interface between new construction and existing roof areas.
   1. Install new polyisocyanurate insulation, mechanically fastened, to match existing insulation thickness and to maintain the slope of the existing insulation.
   2. Install 60 mil fully adhered PVC membrane to lap a minimum of 12 inches onto existing PVC membrane.

3.4 DECK REPAIR

A. Steel deck repairs:
   1. Remove damage decking across the entire width of individual sections by a length equal to a minimum of two joist bays.
   2. Install new galvanized steel decking, to match the thickness, gauge and cross section configuration of the existing deck.
   3. Fasten new deck to the joists / beams with #12 screws spaced 6 inches on center in each joist / beam.
   4. Stitch side seams of steel deck with #10 screws spaced 24 inches apart.

3.5 INSULATION AND COVER BOARD

A. Install tapered insulation and crickets, neatly cut at all miters and transitions.
   1. Do not lace corner boards.
   2. Install the crickets under the new insulation

B. Install insulation with joints offset between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

C. Fasten new and replacement layers of insulation only to the top flute of the steel deck, with screws and discs which penetrate through the deck a minimum of 3/4 inch and a maximum of 1-1/2 inches.
   1. Install 16 fasteners per 4 by 8 foot insulation board in the field of the roof.
   2. Install 28 fasteners per 4 by 8 foot insulation board in 12 foot wide perimeter zones.
   3. Install 32 fasteners per 4 by 8 foot insulation board in 12 foot square corner zones.
   4. Carefully choose the length and position of each screw to ensure the screws do not protrude through the underside of the deck where visible inside the school.

D. Install gypsum cover board over the insulation with joints offset between rows and the insulation a minimum of 12 inches. Cut gypsum cover board to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

3.6 PREPARATION

A. Remove all of the existing roof system down to the roof deck affected by new work, including all existing composition base flashings. Dispose of all materials properly. Perform asbestos removal in accordance with federal, state and local regulations and dispose of waste in legal manner.
   1. At penetrations, remove all existing flashings, including lead, asphalt, mastic, etc.

2. At walls, curbs, and other vertical and sloped surfaces, remove loose and unsecured flashings; remove mineral surfaced and coated flashings; remove excessive asphalt to provide a smooth, sound surface for new flashings.

B. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

C. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

D. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.

3.7 SINGLE-PLY MEMBRANE INSTALLATION

A. PVC

1. Scrape, sweep and blow the coverboard substrate so it is free of all foreign material immediately prior to applying the adhesive.
2. Apply adhesive to the substrate using solvent-resistant 3/4 inch nap paint rollers, in a smooth, even coating with no gaps, globs, puddles or similar inconsistencies. Only apply adhesive to those areas that will be completely covered the same day. Allow the adhesive to dry completely prior to installing the PVC.
    a. Open each can of adhesive and stir it with an electric paddle mixer for at least 5 minutes before applying the adhesive. Re-stir adhesive that isn't used within two hours of initial mixing.
    b. Do not punch holes in cans of adhesive and use them in a "better spreader" without mixing.
    c. Replace roller covers each day; discard covers after each days use.
        a) Unroll the PVC when the adhesive on the substrate is dry, overlapping adjacent sheets a minimum of 4 inches. Turn back one-half of the sheet's length and roller coat the underside of the sheet with adhesive. Roll the PVC onto the adhesive coated substrate when the adhesive has dried slightly to produce strings when touched with a dry finger. Do not allow the adhesive on the underside of the PVC to dry completely before bonding the sheet to the substrate.
        b) Firmly press the sheet into the adhesive, and roll it with a water- filled, foam-covered lawn roller by frequent rolling in two directions.
        c) Fold the un-bonded half of the sheet back and repeat the procedure.
        d) Do not apply adhesive to seam areas.
        e) Roofing installed over improperly applied adhesive, using adhesive that wasn't opened and stirred, and roofing installed with blisters, ridges, mole runs and similar deficiencies shall be removed and replaced at the Contractor's expense.
        f) Count and prepare a written log to show the number of pails of adhesive used in each roof area, each day, to verify to correct amount of adhesive is being applied. Provide copies of the log to the Manufacturer.

B. SEAMS

1. General:
    a. Clean PVC surfaces prior to hot-air heat welding. Weld dry surfaces only.
    b. Hot-air weld all PVC roof and flashing seams to finish 3 inches wide when automatic machine welded and 4 inches wide when hand welded.
    c. Use welding equipment that is provided by or approved by the material Manufacturer.
    d. Perform welding only using personnel that have successfully completed a training course provided by a Manufacturer's Technical Representative.
    e. Allow hot air welding equipment to warm up for at least one minute prior to welding.

2. Hand Welding:
   a. Complete hand welded seams in two stages.
   b. Form a narrow but continuous weld to close the back edge of the seam, and prevent loss of hot air during the final welding.
   c. Insert the nozzle into the seam at a 45 degree angle to the edge of the membrane. Heat the PVC until it begins to "flow," then press the PVC sheets together, and use a hand roller to rub the seam.
   d. Use a 1-1/2 inch wide nozzle for straight seams. Use a 3/4 inch wide nozzle for corners and compound seams.
3. Machine Welding:
   a. Form machine welded seams using automatic welding equipment. Follow the machine Manufacturers instructions and local codes for electric current supply, grounding and over current protection. Utilize a dedicated circuit if connected to house power, or provide a dedicated portable generator. Do not run other equipment off the generator used to power the automatic welding machine.
   b. Use metal tracks placed on the PVC under the machine welder if needed to eliminate wrinkles.
4. Quality Control of Welded Seams:
   a. Visually inspect all seams as they are formed, and then check the entire length of each seam for continuity using a rounded cotter pin removal tool.
      a) Evidence that welding is proceeding correctly, is visible smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of a small amount of dark gray material from the underside of the top PVC sheet.
   b. Evaluate all welded seams each day as they are formed, and at locations as directed by the Owner's or the Manufacturer's representatives.
      a) Cut and examine 1 inch wide cross section samples of welded seams at least three times a day. Correct welds display failure from shearing of the PVC sheet, prior to separation of the weld. Install a target patch over each test cut.

C. FLASHING
1. Install penetration flashings concurrently with the PVC roof as the job progresses. Do not install temporary flashings.
2. Fully adhere flashings to compatible, dry, smooth, and solvent- resistant surfaces, by applying adhesive in smooth, even coats with no gaps, globs or similar inconsistencies. Press the sheet firmly in place and thoroughly roll it with a hand roller.
3. Do not apply adhesive in seam areas that are to be welded. Overlap edges of adjoining flashing sheets a minimum of 4 inches. Hot air weld all flashing seams.
   a. Install factory prefabricated corners on all inside and outside corners.
   b. Mechanically fasten the top edge of all flashings 6 inches on center.
   c. Coordinate with installations of drains, hatches, rooftop equipment and accessories specified elsewhere.

3.8 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
1. Use specified walkway pads unless otherwise indicated.
2. Do not install walkway pads within 10 feet (30 m) of any roof edge or perimeter.

B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch (25 mm) and maximum of 3.0 inches (75 mm) from each other to allow for drainage.
1. Do not install walkway over roof seams.
2. Hold adhesive back 2 inches from walkway edges.

C. Pavers: Install butted tightly, not more than 1/2 inch (12 mm) apart.

1. Pavers for Walkways: Prior to setting pavers, adhere an additional layer of roofing membrane over area where pavers will be laid, extending minimum of 2 inches (50 mm) beyond the paver.

3.9 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Conduct an inspection of the interior and exterior of the building and grounds, and submit a written report with photos to document any pre- existing leakage or damage, prior to performing any work.

B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.

F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.10 WASTE MANAGEMENT - Coordinate with Section 01 7419

A. Separate and recycle materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.

B. Set aside and protect materials suitable for reuse and/or remanufacturing.

C. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

3.11 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

END OF SECTION

SECTION 07 5323
EPDM WRAPPPED DUCTWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules, and keynotes, as specified, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
   1. Cover rooftop ductwork with isocyanurate insulation and fully adhered unreinforced EPDM. Configure the insulation so the top surfaces slope 1/4 inch per foot for drainage. Install acrylic color coating on the EPDM duct wrap.
      a. Protect all roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry.

B. Section 07 6200 - Sheet Metal Flashing and Specialties

C. Section 07 7200 - Roof Accessories.

1.4 CODE APPROVAL REQUIREMENTS

A. Install roofing and insulation system components to meet the following minimum requirements:
   1. New York State Uniform Fire Prevention and Building Code, which includes by reference the New York State Energy Conservation Code.
   2. Underwriters Laboratories Inc. Class A External Fire Rating for roof assemblies tested in accordance with ASTM E 108 or UL 790.
   3. Underwriters Laboratories Inc. Standard 1256 for roof assemblies with foam insulation.
   4. Minimum wind uplift pressure calculated using ASCE 7 and a safety factor of 2:
      a. Field Zone - 60 psf
      b. Perimeter Zones - 100 psf
      c. Corner Zone - 150 psf

B. Provide written certification from the roof material Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
      a. The Installer shall directly employ the personnel performing the work of this section.

B. Material Quality: Obtain each product, including the insulation, cover board, EPDM roofing and flashing, and the cements, primers and adhesives from a single Manufacturer, which has manufactured the same products in the United States of America for not less than 5 continuous years.

1.6 PRE-CONSTRUCTION CONFERENCE

A. Meet at the project site between one and two weeks prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
   1. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.

2. The condition of the substrate (deck), curbs, penetrations and other preparatory work needed.
3. Incomplete submittals; note that progress payments will be not processed until all submittals are received and approved.

1.7 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any work on site:
   1. A pre-work site and building inspection report with photos to document conditions before work starts.
   2. Manufacturer's technical data sheets for each component of the EPDM wrap.
   3. Samples of the Contractor's Guarantee and Manufacturer's warranty forms.

B. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
   1. Submittals shall be prepared and made by the firm that will perform the actual work.
   2. Provide electronic submittals in pdf format on USB drives, organized in folders by Section.

C. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building.

D. Payment requisitions will not be processed until all submittals are received and approved.

1.8 JOB CONDITIONS (CAUTIONS & WARNINGS)

A. Do not use oil or solvent based roof cement with EPDM . Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose EPDM and accessories to a temperature in excess of 175 degrees Fahrenheit.

B. Splice cleaner, primer, cements and bonding adhesives are flammable. Do not breathe the vapors or use these products near fire or flame or in a confined or unventilated area. Dispense only from a UL listed safety can or the Manufacturer's original container.

C. Remove empty adhesive, cleaner and solvent containers and contaminated rags from the roof and legally dispose of them daily.

D. Do not apply primer, cleaners or adhesives next to ventilation system louvers or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent odors from entering the building. Remove temporary covers at the end of each days work.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers,

B. Cover all stored materials, except rolls of EPDM and sealed cans of adhesives, with watertight tarpaulins installed immediately upon delivery.

C. Immediately remove insulation which gets wet from the job site.

D. Do not overload the structure when storing materials on the roof.

E. Store and install all material within the Manufacturer's recommended temperature range.

F. Protect all roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.10 GUARANTEE AND WARRANTY

A. Provide a written Contractor's Guarantee which guaranties that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:

1. Defects include but are not limited to the following: leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion or shrinkage.
2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as guaranteed at his own expense:
3. Guarantee coverage shall include removing and replacing materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
4. Guarantee coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
5. Guarantee coverage shall have no dollar value limit.
6. Provide one Contractor's Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.

B. The Manufacturer's Warranty and Contractors Guarantee shall take effect no more than 30 days before the completion of all punch list work.

C. Guarantee and Warranty coverage may be cancelled, for the affected portion of the EPDM, if the work is damaged by winds in excess of 72 mph, by hail, lightning, insects or animals, by failure of the structural substrate, by exposure to harmful chemicals, by other trades on the roof, or by vandalism, or if the Owner fails to maintain the roof in accordance with, or makes roof alterations contrary to, the Manufacturer's printed recommendations.
   1. Guarantee and Warranty coverage shall be reinstated, for the remainder of the original period; if the Owner restores the EPDM to the condition it was in prior to the damage occurring.

1.11 SUBSTITUTIONS

A. Refer to Section 01 2500 Substitution Procedures for additional requirements.

PART 2 PRODUCTS

2.1 GENERAL

A. EPDM components are specified as products of Firestone Building Products Company to establish a standard of quality. Equal products and systems from Carlisle SynTec or Johns Manville will be accepted.

B. Primary products required for this project include:
   1. Roof insulation
   2. Cover board
   3. EPDM roofing
   4. Primers and adhesives
   5. Sealants
   6. EPDM flashing
   7. Fasteners

2.2 EPDM

A. Unreinforced 60 mils thick, fire retardant, EPDM (Ethylene Propylene Diene Monomer) sheet membrane conforming to the following minimum physical properties.

	PROPERTY	TEST METHOD	SPECIFICATION
2.	-	Gray/Black	
3.	Tensile Strength	ASTM D-412	1305 psi min.
4.	Elongation	ASTM D-412	300% min
5.	Tear Strength	ASTM D-624	150 lb/in min
6.	Ozone Resistance	ASTM D-1149	No cracks, 7 days/100
7.	pphm/100ºF/50% strain		

8. Heat Aging ASTM D-573 1200 psi min@ 200%
9. elongation/4 wks/240ºF
10. Brittleness Temperature ASTM D-746 -49ºF
11. Water Vapor Permanence ASTM E-96 2.0 perm max
12. Thickness ASTM D-412 60 mils plus/minus 6 mils
13. Fire Retardant UL Class A
    a. Self Adhesive EPDM will be accepted only if the installation schedule indicates that all roofing will be applied strictly within the Manufacturer's recommended temperature range.
        a) The same type of EPDM material - SA EPDM or regular EPDM with field applied bonding adhesive, shall be used for the entire project.
            (a) EPDM that is applied with mole runs, blisters, or similar un-adhered sections shall be removed and replaced at the Contractor's expense. Removal and replacement work shall include the underlying cover board and insulation so the finished roof consists of a complete new un-compromised assembly.
            (b) Claims by the material Manufacturer, that mole runs, blister and similar un-adhered deficiencies won't affect performance will not change this requirement.
14. Color : White, including all related patches, splices,stripping, seam tapes, etc.

2.3 RELATED MATERIALS

A. Cleaners, adhesives, sealants, caulking and fasteners furnished by the EPDM system Manufacturer, that comply with low VOC regulations in effect at the time of application.
1. Stripping: 90 mil thick 5 inch and 9 inch wide self adhering flashing, consisting of 45 mils of semi-cured EPDM factory laminated to 45 mils of cured seaming tape.
2. Bonding Adhesive: High strength contact adhesive.
3. Splice Adhesive: High strength synthetic polymer based contact cement formulated specifically to splice EPDM sheets.
4. Lap Sealant: EPDM rubber based gun grade sealant.
5. Water Block Seal: One component low viscosity butyl rubber sealant.
6. Pre-Molded Pipe Flashing: Pressure sensitive prefabricated flashings with pre-applied adhesive.
7. Pourable Sealer: Two component, solvent free polyurethane based sealant.
8. Reinforced Perimeter Fastening Strips: .030 inch thick reinforced cured EPDM.
9. Seam Tape Primer: Synthetic rubber polymer based primer designed to clean and prime seam tape spice areas prior to installing the tape.
10. Seam Splice Tape: Nominal 30 mil thick cured polymer self adhesive tape with release paper carrier, 6 inches wide for field applied tape, and 3 inches wide for factory applied tape.
11. Plates and Bars: Galvanized and corrosion resistant specialty products.
12. Fasteners: #14 Fluorocarbon polymer coated heavy duty screws.

B. Insulation: Flat and tapered rigid cellular polyisocyanurate boards with fibrous felt/fiberglass mat facers, minimum compressive strength 20 psi, meeting ASTM C1289-01, Type II, Class1, Grade 2, as manufactured by Firestone under the trade name of "ISO 95+ Isocyanurate Insulation". Minimum thickness 5-1/2 inches as shown on the roof plan.
1. Tapered insulation sloping 1/4 inch per foot.
2. Crickets sloping 1/2 inch per foot.

C. Tapered edge strips - high density isocyanurate or wood fiberboard strips installed at the drain sumps, and insulation transition points.

D. Insulation adhesive: Two component low rise polyurethane foam adhesive, installed with a mixing extruding Pace Cart dispenser, or with a pleural heated foam rig, Firestone I.S.O. Adhesive.
   1. Use insulation adhesive suitable for application at the intended application temperatures.
   2. Do not use twin cartridge “caulking gun” adhesive except on very small isolated sections of roof.

PART 3 EXECUTION

3.1 GENERAL

A. Install the EPDM in a watertight, workmanlike manner, meeting the guarantee requirements specified herein; in accordance with the drawings and in conformance with the Manufacturer's requirements, except as enhanced by the drawings and specifications.

B. Perform work next to roof mounted mechanical equipment and windows, so the work coincides with equipment shutdown periods and building vacancies, and does not affect building occupants. Temporarily cover and protect equipment openings, and windows next to the work area, with 6 mil fire retardant polyethylene, so dirt, dust and odors do not enter the equipment or building. Remove covers as soon as the work is complete and at the end of each workday.

C. Clean substrate surfaces of all laitance, dirt, oil, grease or other foreign matter.

D. Remove debris daily and as it is generated. Do not stock-pile debris on the roof. Do not leave any debris on the roof at the end of the day. Do not overload the roof structure when moving debris.

E. Install roof system components on dry surfaces only. Do not install any components when the weather and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.

F. Complete all work including the equipment flashings, in sequence as quickly as possible so the smallest area possible is under construction at any one time. Complete the entire area of work begun each day, the same day, and make all exposed edges watertight at the end of each day's work.

G. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

3.2 INSULATION AND COVER BOARD

A. Install tapered insulation neatly cut at all miters and transitions. Do not lace corner boards.

3.3 EPDM

A. Place EPDM on the substrate without stretching it, and allow it to relax approximately one hour - before starting to adhere it to the substrate and form the seams.

B. Place adjoining sheets in the same manner lapping the edges to shed water.

C. Fully adhere EPDM to the substrate with bonding adhesive.
   1. Open each can of adhesive and stir it with an electric paddle mixer for at least 5 minutes before applying the adhesive. Re-stir adhesive that isn’t used within two hours of initial mixing.
   2. Do not punch holes in cans of adhesive and use them in a “Better Spreader” without first opening the cans to mix them.
   3. Replace used roller covers each day; discard covers after each days use.
   4. Allow bonding adhesive to dry to the touch before joining the EPDM to the substrate.
   5. Roll the EPDM onto the dried bonding adhesive and immediately rub it vigorously with a soft bristle broom to ensure complete adhesion.
   6. EPDM installed over improperly applied adhesive or with adhesive that wasn’t stirred, and EPDM installed with blisters, ridges, mole runs and similar deficiencies shall be removed and replaced at the Contractor’s expense. Removal shall include the insulation and cover board assembly.

3.4 SPLICING

A. Form EPDM splices with 6 inch wide field applied seam tape, or with 3 inch wide factory applied seam tape.

1. Fold the top sheet back and clean mating surfaces using clean rags with splice wash.
2. Scrub a smooth coat of primer onto the mating surfaces, with long strokes, and to obtain complete coverage, using approximately 1 gallon per 225 square feet. Do not allow the primer to glop, streak or puddle; allow it to dry to the touch before installing the seam tape.
3. Seam tape shall be positioned so 1/8 inch minimum and 1/2 inch maximum will be exposed at the seam edge when the seam is complete.
    a. Install 5 inch uncured EPDM stripping over any seam where the tape is exposed less than 1/8 inch or more than 1/2 inch.
        a) Roll and allow the top sheet to fall freely into place without stretching or wrinkling it.
        b) Pull splice tape release paper from within the seam and neatly mate the seam using hand pressure to rub the membrane together.
        c) Immediately roll the splice with a 2 inch wide roller, using positive pressure, toward the outer edge of splice.

B. Install uncured EPDM target patches with rounded corners, over all T-Seam intersections.

3.5 FLASHINGS

A. Utilized cured EPDM for all flashings; utilize self-curing EPDM at corners and angle changes only where required by the Manufacturer.
1. Form flashing splices, and the splice between the flashing and main sheet with 6 inch seam tape.
2. Adhere the flashing to vertical surfaces with bonding adhesive.
3. Fasten the top edge of all flashings, positioning the fasteners 12 inches on center, to be covered by a cap flashing.

3.6 DUCT WRAP WATERPROOFING:

A. Inspect the ducts and remove any residual tape or other debris from their surfaces before wrapping them. Cover the ductwork with isocyanurate insulation and fully adhered 60 mil thick white EPDM roofing.
1. Install EPDM cover strips and target patches to seal all duct air leaks before installing the insulation. .
2. Install flat 3 inch thick insulation on the sides and bottom of the ducts.
3. Install tapered insulation sloping 1/4 inch per foot, minimum-starting thickness 3 inches, on top of the ducts.
4. Secure the isocyanurate insulation with screws and plates, installed at the rate of one fastener per 2 square feet.
5. Cover the insulation with fully adhered 60 mil fire retardant white EPDM.

3.7 MISCELLANEOUS

A. Provide any miscellaneous roofing, flashing, caulking, and metal work needed to leave the new roof complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

B. Use mechanics skilled and licensed in the trades to perform mechanical and electrical work. Provide new material, couplings, transition pieces, blocking, fasteners and the like needed to complete the work.

3.8 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any leaks or damage, prior to performing any other work on site.

B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that weren't documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site presents a neat, orderly and workmanlike appearance. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.

F. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.9 ROOF INSPECTIONS BY MANUFACTURER

A. Arrange for the roofing Manufacturer, or his authorized representative, to make a minimum of five inspections in accordance with the following schedule and submit a written report of each inspection to the Architect.
   1. First inspection during the first two days of new roof installation.
   2. Second inspection when roofing is approximately one third complete.
   3. Third inspection when roofing is approximately two thirds complete.
   4. Fourth inspection when all roofing and flashings are installed.
   5. Final inspection at the completion of all work.

B. Provide 48 hours advance written notice to the Architect, so he may have a representative attend the inspections.

C. Submit the inspection reports within one week following each inspection.
   1. Payment requisitions will not be reviewed nor approved until the inspection reports are received.

END OF SECTION

SECTION 07 5419
PVC ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Applicable provisions of the Conditions of the Contract and Division 1, General Requirements, govern work in this Section.

1.2 SUMMARY

A. The Work of this Section includes all plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
   1. Clean all residual construction debris and non-roofing material from the surface of the deck, and the flutes of the steel deck.
   2. Install a new fully adhered reinforced 60 mil thick PVC roofing system, including insulation, cover board, flashing, stripping and related accessories.
   3. Provide any miscellaneous mechanical, electrical, hoisting and other work needed, and remove, adjust, modify, reset and reconnect all roof-mounted and roof-penetrating devices.
   4. Install new flashings at the roof drains, and all roof-mounted and roof-penetrating equipment.
   5. Perform Waste Management; coordinate with Section 01 7419.
   6. Install vapor barrier over concrete substrates.

1.3 RELATED REQUIREMENTS

A. Masonry- Section 04 2000

B. Sheet Metal Flashing & Accessories - Section 07 6200

C. Roof Related Carpentry - Section 06 1010

D. Roof Specialties - Section 07 7100

1.4 CODE APPROVAL REQUIREMENTS

A. Install roofing and insulation system components to meet the following minimum requirements:
   1. New York State Uniform Fire Prevention and Building Code.
   2. Underwriters Laboratories Inc. Class A External Fire Rating for Roof Covering Materials.
   3. ASCE 7 uplift resistance, calculated using a safety factor of 2:
      a. Field Zone – 60 psf
      b. Perimeter Zones - 100 psf
      c. Corner Zone - 150 psf

B. Provide written certification from the Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. A firm (Installer) with at least 5 continuous years experience performing roofing work similar to that required for this project, employing personnel skilled in the specified work.
      a. The Installer shall directly employ the personnel performing the work of this section.
      b. The Installer shall have a full time Supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience in roofing work similar in nature and scope to this project, and speak fluent English.
   2. The Installer shall provide a reference list of at least three projects of comparable size and similar design, within fifty miles of this project, which may be observed by representatives of the Owner:

a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
b. The Installer shall provide the reference list prior to contract award if requested.

3. The Installer shall be acceptable to or licensed by the Manufacturer of the primary roofing materials, and provide written certification from the Manufacturer to confirm this prior to award if requested.

B. Material Quality: Obtain each product, including the insulation, cover board, PVC roofing and flashing, and the cements, primers and adhesives from a single Manufacturer, which has manufactured the same products in the United States of America for not less than 5 continuous years.

C. Pre-Work Conference: Meet at the project site approximately one week prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
1. How the existing building will be kept watertight as work progresses.
2. How new roofing will be coordinated with the installation of the insulation, cover board, flashings and other items to provide a watertight installation.
3. Generally accepted industry practice, and the Manufacturer's instructions for handling and installing his products.
4. The condition of the substrate (deck), curbs, penetrations and other preparatory work needed.
5. Incomplete submittals; note that progress payments will not be processed until all submittals are received and approved.
6. The construction schedule, forecast weather, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
7. A schedule for Manufacturer and Architects inspection.

1.6 SUBMITTALS – Coordinate with Section 01 3000

A. Submittals shall be made in groupings where installations are complimentary, i.e., steel, steel decking, steel stairs, stair railings; roof systems, roof flashings, wood blocking, etc. Partial and incomplete submittals that fail to comply with this requirement will be rejected.

B. Prepare and submit a fully developed submittal schedule as set forth in Sections 01 3000. Note the review times set forth in Section 01 3000 are average; for large submissions allow longer review times.

C. Review and comply with Section 01 4000 for coordination drawing requirements. Coordination drawings are critical to the proper execution of the work, and failure to comply with these requirements will likely result in the denial of all claims for additional construction time and/or money.

D. Submit the following items far enough in advance to obtain approval prior to performing any work:
1. A written pre-work site and building inspection report with photos to document conditions before work starts.
2. Written certification from the Manufacturer which states that the Installer is acceptable or licensed to install the specified roofing; if not previously provided.
3. Manufacturer's installation instructions and technical data sheets for each material component of the roofing system. Material sample submittals are needed for color and finish review..
4. Samples of the Contractor's and Manufacturer's guarantee/warranty forms.
5. Simultaneously provide all technical submittals needed for this section. Submittals shall be prepared by firm performing the work.

1.7 JOB CONDITIONS (CAUTIONS & WARNINGS)

A. Do not use oil base or plastic roof cement with PVC roofing. Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose PVC roofing and accessories to a temperature in excess of 175 degrees Fahrenheit.

B. Splice cleaner, primers, cements and bonding adhesives are flammable. Do not breathe vapors or use near fire or flame or in a confined or unventilated area. Dispense only from a UL listed or approved safety can.

C. Remove empty adhesive and solvent containers and contaminated rags from the roof and legally dispose of them at the end of each work day.

D. Do not apply adhesives next to open ventilation system louvers or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent adhesive odors from entering the building. Remove temporary covers at the end of each work day.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packages, bearing intact and legible labels which identify the type and name of the product and Manufacturer.

B. Cover all stored materials, except rolls of PVC and sealed cans of adhesives, with watertight tarpaulins installed immediately upon delivery.

C. Immediately remove any insulation or cover board which gets wet from the job site.

D. Do not overload the structure when storing materials on the roof.

E. Store and install all material within the Manufacturer’s recommended temperature range.

1.9 GUARANTEE/WARRANTY

A. Provide a written Manufacturer's "Full System Guarantee/Warranty" which warrants that the roofing system, including the insulation, PVC roofing and flashings, will remain in a watertight condition for a twenty year period beginning upon Final Completion.
   1. Guarantee and Warranty coverage shall remain in for wind speeds up to 72 miles per hour measured at ground level at the site.
   2. Guarantee and Warranty coverage shall have no dollar value limit.

B. Provide a Contractor's written Guarantee which warrants that all work willremain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:
   1. Defective work includes but is not limited to the following types of failure: leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion.
   2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense:
   3. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.

C. Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.

D. Guarantees/Warranties shall include the removal and replacement of items or materials installed with the PVC roof as part of the original work, if removal and replacement is needed to make warranty repairs.

E. Guarantee/Warranty coverage may be cancelled, for the affected portion of the roof, if the work is damaged by winds in excess of 72 mph, by hail, lightning, insects or animals, by failure of the structural substrate, by exposure to harmful chemicals, by other trades on the roof, or by vandalism, or if the Owner fails to maintain the roof in accordance with, or makes roof alterations contrary to, the Manufacturers printed recommendations.

F. Guarantee/Warranty coverage shall be reinstated, for the remainder of the original term, if the Owner restores the roof to the condition it was in prior to the damage occurring.

G. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.

PART 2 - PRODUCTS

2.1 GENERAL

A. PVC system components are specified as products of Sika Sarnafil Inc. to establish a standard of quality. Equal products and systems by Johns Manville or Carlisle SynTec will be accepted, if offered as a substitute with sufficient data to establish the substitute materials meet the criteria established in this specification.

B. Primary products required for this project include:
1. Roof insulation
2. Gypsum cover board
3. PVC roofing
4. Primers and adhesives
5. Sealants
6. PVC flashing and walkways
7. Fasteners

2.2 MATERIALS:

A. Insulation: Rigid cellular polyisocyanurate boards with fibrous felt/fiberglass mat facers, minimum compressive strength 20 psi, meet ASTM C1289-01, Type II, Class 1, Grade 2, Standards as manufactured by Sarnafil under the trade name Sarnatherm.
1. Tapered insulation sloping 1/4 inch per foot, minimum starting thickness as indicated on the roof plan.
2. Crickets sloping 1/2 inch per foot.
3. Isocyanurate tapered edge strips installed at transitions and in the drain sumps.

B. Gypsum Cover Board: 1/4 inch thick fire resistant gypsum board decking with inorganic glass mat facers and a water resistant core, formulated in 48 x 96 inch square edge boards, UL Class A, meeting ASTM C-1177, manufactured under the trade name Dens-Deck Prime.

C. Insulation adhesive: Two component low rise foam adhesive, installed with a mixing extruding dispenser (a Pace Cart or Heated Pleural Extruding Spray Rig) intended for application at the temperatures that will be encountered.
1. DO not use twin-cartridge caulking tube adhesive.

D. PVC: 60 mils thick, plus or minus 2 mils maximum, fire retardant, fiberglass reinforced, PVC (polyvinyl chloride) G410 lacquer coated sheetmembrane conforming to the following minimum physical properties:
1. Properties ASTM Test Method Minimum Property Fiberglass Reinforcing Material
2. Overall Thickness, inches D638 0.060
3. Tensile Strength, min., psi D638 1500
4. Elongation at Break,
5. (machine x transverse) D638 250% X 230% Seam strength, % of tensile strength) D638 75
6. Properties after Heat Aging per D3045 - Tensile Strength, % of original D638 90
7. Elongation, % of original D751 90
   a. Tearing Resistance, lbf D1004 10

b. Low Temperature Bend @ -40ºF D136 Pass Accelerated Weather, Xenon Arc D2565 5,000 Hrs
c. Cracking @ 7x magnification None
d. Discoloration by observation Negligible
e. Crazing @ 7 x magnification None Linear Dimensional Change, max. D1204 0.10% Weight Change Immersion in Water D570 ± 3.0% Static Puncture Resistance, 33 lbf D5602 Pass
f. Dynamic Puncture Resistance, 7.3 ft-lbf D5635 Pass Fire Rating UL Class A
g. Color: white

E. Vapor Retarders
1. Self-adhered, SBS-modified bitumen with tri-laminated, woven polyethylene top surface and integral release film on bottom; use over steel, concrete portion of roof substrates.
a. Product: IB Roof Systems; IBarrier SA Membrane.

F.

G. ACCESSORY MATERIALS
1. Cleaners, adhesives, sealants, caulking and fasteners furnished by the PVC system Manufacturer and as listed below. Use low VOC products as required by regulations in effect at the time of application.
2. Wall and Curb Flashing: G410 fiberglass reinforced PVC, color to match the color of the roof
3. Pitch Pocket Filler: Two component urethane sealant.
4. Corners: Prefabricated outside and inside flashing corners factory formed of 60 mil thick unreinforced PVC, color to match the color of the roof.
5. Sealant: One component acrylic-based resin blended with solvent and inorganic adhesives.
6. PVC Adhesive: Solvent-based reactivating-type adhesive, Sarnacol 2170.
7. Insulation Plates: 3 inch square, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating.
8. Fasteners: #14 corrosion-resistant screws.
9. Aluminum Tape:2 inch wide pressure-sensitive aluminum tape.
10. Solvent Cleaner: One component liquid for the general cleaning of residual asphalt, scuff marks, etc., from the membrane surface and to clean seam areas prior to hot-air welding.
11. Walkway Pads: JM PVC Heavy-duty 150 mil thick, textured, reinforced, fully adhered, walkway pad. Prepare and install per manufacturers written instructions.
a. Do not install walkway over roof seams.
b. Hold adhesive back 2 inches from walkway edges.

PART 3 - EXECUTION

3.1 GENERAL

A. Construct the new roofing system in a watertight, workmanlike manner, meeting the guarantee requirements specified herein; in strict accordance with the drawings and in conformance with the Manufacturer's requirements, except as enhanced in this specification.

B. Perform work next to roof mounted mechanical equipment, so the work coincides with equipment shutdown periods and does not affect building occupants. Temporarily cover and protect equipment openings, and windows adjoining the work area, with 6 mil fire retardant polyethylene, so dirt, dust and odors do not enter the equipment or building. Remove covers at the end of each workday, and as soon as roof work is complete.

C. Clean the surface on which roofing system components will be applied, of all laitance, dirt, oil, grease or other foreign matter which would in any way affect the quality of the installation.

D. Install roof system components on dry surfaces only. Do not install any items when weather conditions and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.

E. Complete all work in sequence as quickly as possible so that as small an area as practicable is in the process of construction at any one time. Complete the entire area of work begun each day, the same day, and make all exposed edges watertight at the end of each day's work.

3.2 SUBSTRATE INSPECTION

A. Remove all residual debris and carefully check the existing deck. To be an acceptable surface for the new roofing system, it is to be well secured to the underlying structure and not otherwise damaged or deteriorated.

B. Immediately notify the Architect and Owner by telephone and in writing if defects in the deck substrate are discovered.

3.3 INSULATION AND COVER BOARD

A. Install tapered insulation neatly cut at all miters and transitions. Do not lace corner boards.

B. Install insulation with joints offset between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

C. Fasten all layers of insulation only to the top flute of steel decks with screws and discs which penetrate through the deck a minimum of 3/4 inch and a maximum of 1-1/2 inches.
   1. Install 16 fasteners per 4 by 8 foot insulation board in the field of the roof.
   2. Install 28 fasteners per 4 by 8 foot insulation board in 12 foot wide perimeter zones.
   3. Install 32 fasteners per 4 by 8 foot insulation board in 12 foot square corner zones.

D. Carefully choose the length and position of each screw to ensure the screws do not protrude through the underside of the deck where visible inside the school.

E. Install the gypsum cover board in low rise polyurethane foam adhesive applied in accordance with the Manufacturer’s recommendations and to achieve the specified minimum uplift resistance.
   1. Install 1/2 inch diameter adhesive beads spaced 12 inches on center in the field of the roof.
   2. Install 1/2 inch diameter adhesive beads spaced 6 inches on center in 12 foot wide perimeter zones.
   3. Install 1/2 inch diameter adhesive beads spaced 4 inches on center in 12 foot square corner zones.
   4. Place 5 gallon pails half full of gravel or concrete on the gypsum cover board to hold it firmly in position while the low rise foam adhesive sets. Position the pails no more than approximately 24 inches apart in all directions.
   5. Carefully scrape and remove any foam adhesive that gets on the top surface of the coverboard.

3.4 PVC

A. Scrape, sweep and blow the coverboard substrate so it is free of all foreign material immediately prior to applying the adhesive.

B. Apply adhesive to the substrate using solvent-resistant 3/4 inch nap paint rollers, in a smooth, even coating with no gaps, globs, puddles or similar inconsistencies. Only apply adhesive to those areas that will be completely covered the same day. Allow the adhesive to dry completely prior to installing the PVC.
   1. Open each can of adhesive and stir it with an electric paddle mixer for at least 5 minutes before applying the adhesive. Re-stir adhesive that isn’t used within two hours of initial mixing.
   2. Do not punch holes in cans of adhesive and use them in a “better spreader” without mixing.
   3. Replace roller covers each day; discard covers after each days use.
      a. Unroll the PVC when the adhesive on the substrate is dry, overlapping adjacent sheets a minimum of 4 inches. Turn back one-half of the sheet’s length and roller coat the underside of the sheet with adhesive. Roll the PVC onto the adhesive coated substrate when the adhesive has dried slightly to produce strings when touched with a dry finger. Do not allow

the adhesive on the underside of the PVC to dry completely before bonding the sheet to the substrate.

b. Firmly press the sheet into the adhesive, and roll it with a water- filled, foam-covered lawn roller by frequent rolling in two directions.

c. Fold the un-bonded half of the sheet back and repeat the procedure.

d. Do not apply adhesive to seam areas.

e. Roofing installed over improperly applied adhesive, using adhesive that wasn't opened and stirred, and roofing installed with blisters, ridges, mole runs and similar deficiencies shall be removed and replaced at the Contractor's expense.

f. Count and prepare a written log to show the number of pails of adhesive used in each roof area, each day, to verify to correct amount of adhesive is being applied. Provide copies of the log to the Manufacturer.

3.5 SEAMS

A. General:

1. Clean PVC surfaces prior to hot-air heat welding. Weld dry surfaces only.
2. Hot-air weld all PVC roof and flashing seams to finish 3 inches wide when automatic machine welded and 4 inches wide when hand welded.
3. Use welding equipment that is provided by or approved by the material Manufacturer.
4. Perform welding only using personnel that have successfully completed a training course provided by a Manufacturer's Technical Representative.
5. Allow hot air welding equipment to warm up for at least one minute prior to welding.

B. Hand Welding:

1. Complete hand welded seams in two stages.
2. Form a narrow but continuous weld to close the back edge of the seam, and prevent loss of hot air during the final welding.
3. Insert the nozzle into the seam at a 45 degree angle to the edge of the membrane. Heat the PVC until it begins to "flow," then press the PVC sheets together, and use a hand roller to rub the seam.
4. Use a 1-1/2 inch wide nozzle for straight seams. Use a 3/4 inch wide nozzle for corners and compound seams.

C. Machine Welding:

1. Form machine welded seams using automatic welding equipment. Follow the machine Manufacturers instructions and local codes for electric current supply, grounding and over current protection. Utilize a dedicated circuit if connected to house power, or provide a dedicated portable generator. Do not run other equipment off the generator used to power the automatic welding machine.
2. Use metal tracks placed on the PVC under the machine welder if needed to eliminate wrinkles.

D. Quality Control of Welded Seams:

1. Visually inspect all seams as they are formed, and then check the entire length of each seam for continuity using a rounded cotter pin removal tool.
   a. Evidence that welding is proceeding correctly, is visible smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of a small amount of dark gray material from the underside of the top PVC sheet.
2. Evaluate all welded seams each day as they are formed, and at locations as directed by the Owner's or the Manufacturer's representatives.
   a. Cut and examine 1 inch wide cross section samples of welded seams at least three times a day. Correct welds display failure from shearing of the PVC sheet, prior to separation of the weld. Install a target patch over each test cut.

3.6 FLASHING

A. Install penetration flashings concurrently with the PVC roof as the job progresses. Do not install temporary flashings.

B. Fully adhere flashings to compatible, dry, smooth, and solvent- resistant surfaces, by applying adhesive in smooth, even coats with no gaps, globs or similar inconsistencies. Press the sheet firmly in place and thoroughly roll it with a hand roller.

C. Do not apply adhesive in seam areas that are to be welded. Overlap edges of adjoining flashing sheets a minimum of 4 inches. Hot air weld all flashing seams.

1. Install factory prefabricated corners on all inside and outside corners.
2. Mechanically fasten the top edge of all flashings 6 inches on center.
3. Coordinate with installations of drains, hatches, rooftop equipment and accessories specified elsewhere.

3.7 ROOF DRAINS

A. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.

B. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19 mm) of membrane to extend inside clamping ring past drain bolts.

C. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.

D. Apply sealant on top of drain bowl where clamping ring seats below the membrane

E. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

F.

3.8 MISCELLANEOUS

A. Provide any miscellaneous roofing, flashing, caulking, and metal work needed to leave the work complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

3.9 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Conduct an inspection of the interior and exterior of the building and grounds, and submit a written report with photos to document any pre- existing leakage or damage, prior to performing any work.

B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor’s report, or repaired to the Owners satisfaction at the Contractor’s expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.

F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.10 ROOF INSPECTIONS BY MANUFACTURER

A. Arrange for the roofing Manufacturer, or his authorized representative, to make a minimum of five inspections in accordance with the following schedule and submit a written report of each inspection to the Architect within one week following each inspection.
   1. First inspection during the first two days of roof installation.
   2. Second inspection when roof installation is approximately one third complete.
   3. Third inspection when roof installation is approximately two thirds complete.
   4. Fourth inspection when all roofing and flashings are installed.

B. Provide 48 hours advance written notice to the Architect, so he may have a representative attend the inspections.

C. Payment requisitions will not be reviewed nor approved until the inspection reports are received.

D. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

E. Perform all corrections necessary for issuance of warranty.

3.11 WASTE MANAGEMENT- Coordinate with Section 01 7419

A. Separate and recycle materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.

B. Set aside and protect materials suitable for reuse and/or remanufacturing.

C. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

3.12 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHINGS & SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Sheet metal work that is compatible with the roofing systems specified, including cap and through wall flashings, hook strips, fascia, gutters, leaders, drip edges, gravel stops, factory fabricated roof edge systems, batten seam panels and caps, and miscellaneous flashings.

1.3 Related Requirements

A. Section 04 2000 - Unit Masonry.

B. Section 06 1010 - Roof Related Rough Carpentry.

C. Section 07 4100 - Standing Seam Roofing

D. Section 07 5010 - Modifications to Existing Roofing

E. Section 07 5419 - PVC Roofing

F. Section 07 5323 - EPDM Wrappped Ductwork.

G. Section 07 7200 - Roof Accessories.

1.4 CODE APPROVAL REQUIREMENTS

A. Fabricate and install roof perimeter flashings that comply with the NY State Uniform Fire Prevention and Building Code and with ANSI/SPRI ES-1 “Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems” requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing sheet metal work similar to that required for this project, employing personnel skilled in the work specified.
2. The Installer shall directly employ the personnel performing the work of this section.
3. The Installer shall have a full time supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project, and speak fluent English.
4. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:
   a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner’s name - contact person - phone number and address and the Architect’s name - contact person and phone number.
   b. The Installer shall provide the reference list prior to contract award if requested.

B. Material Quality:

1. Obtain each product from a single Manufacturer which has manufactured the same product in the United States of America for not less than 5 continuous years.
2. Obtain copper and pre-finished sheet metal items from the same mill run to maintain consistent color hue and surface finish.

C. Pre-Construction Conference: Meet at the project site between one and two weeks prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
   1. How the building will be kept watertight as work progresses.
   2. How sheet metal work will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, roofing, flashings, roof accessories and other items to provide a watertight installation.
   3. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.
   4. The condition of the substrate, curbs, penetrations and other preparatory work needed.
   5. Incomplete submittals; note that progress payments will not be processed until all submittals are received and approved.
   6. The construction schedule, weather forecast, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
   7. A schedule for Manufacturer and Architect inspections.

1.6 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any work:
   1. A pre-work site and building inspection report with photos to document conditions before any other work starts on site.
   2. 2 foot long samples of each sheet metal item, to show how it will fit on adjoining masonry and wood blocking assemblies, and with the roof, stripping, and flashings.
   3. 6 inch square pieces of each type of sheet metal to show surface finish, texture and color.
   4. Data literature for each type of sheet metal, sealant and fastener.
   5. Sample of the Contractor’s guarantee form.
   6. Sample of Manufacturer'e warranty/guarantee
   7. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
      a. Submittals shall be prepared and made by the firm that will perform the actual work.
      b. Provide electronic submittals on CD, in pdf format, organized in folders by Section.
      c. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building to the Owner's Representative.

B. Payment requisitions will not be processed until all submittals are received and approved.

1.7 JOB MOCK-UPS

A. After the submittals are approved, prepare in actual job locations, mock-ups of cap and through wall flashings, hook strips, drip edges, fascia, gravel stops, factory fabricated roof edge systems, copings, gutters, leaders, and all other items of sheet metal and related work, for inspection and approval by the Architect.

B. Construct each mock-up of two full lengths of metal, fastened, connected and stripped-in to the related roofing system, to show the following:
   1. Type, gauge, color, cross-sectional dimensions and shape, and joint and mitering techniques.
   2. Related masonry work, wood blocking, and the attachment techniques and fasteners for all wood and metal components.
   3. Other sheet metal related materials and their installation techniques to fully define the detailing of each mock-up.

C. Mock-ups shall be constructed to establish the minimum standard of materials and workmanship, and to assure that completed work which matches the mock-ups will be fully functional and serve the purpose for it has been designed.

D. Approved mock-ups may be left in place and incorporated into the permanent installation. Rejected mock-ups shall be removed and replaced until an acceptable mock-up is approved.

E. Do not purchase or fabricate sheet metal items until mock-up installation, inspection and approval are completed and approval is documented in writing.

1.8 GUARANTEE

A. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:

1. Defective work includes but is not limited to the following: peeling paint, leaks, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion.
2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
3. Guarantee coverage shall include the removal and replacement of components installed as part of the original work, if removal is needed to make guarantee repairs.

B. Provide one Contractor’s Guarantee that covers “all work performed” when a single contractor is awarded work specified in multiple Sections.

C. The Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.

D. The Contractor’s Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor’s Guarantee.

PART 2 PRODUCTS

2.1 MATERIALS

A. Copper sheet: ASTM B370, 99.0 % pure copper, thickness 16 ounces per square foot. Use copper for all metal items not otherwise indicated

B. Zinc-Tin coated copper: copper sheet, coated on both sides, with a smooth uniform coating of zinc and tin, base metal weight 16 ounces per square foot, cold rolled temper, available as Freedom Gray Copper by Revere.

C. Solder:

1. 50-50 tin and lead for plain copper, supplied in one pound bars with the alloy mixture stamped into the bar by the Manufacturer.
2. Lead free / or pure tin solder for zinc-tin coated copper, Number 497 by Johnson Manufacturing.

D. Flux:

1. Water-Soluble Liquid Flux, Kester #3345 for iron soldering of brass and copper.
2. Tin-bearing flux such as “Flux-N-Solder E127 with pure tin” by Johnson Manufacturing.

E. Aluminum fascias, hook strips, gravel stops and miscellaneous trim: #3105-H14 alloy aluminum, minimum thickness .050 inches unless otherwise indicated, mill finish or factory finished as indicated on drawings. .

1. Factory Finish: Fluoropolymer Kynar 500 finish, color as selected by the Architect, from the full range of custom and standard colors

F. Factory Fabricated Roof Edge System: Extruded aluminum, #3105-H14 alloy aluminum, minimum thickness .050 inches, anchor bars secured with #9 stainless steel screws spaced 12 inches on center.

1. Finish: Kynar 500 prefinished aluminum trim covers, independently tested to comply with the ANSI / SPRI ES-1 Wind Design Guide.
2. Product: Metel-Era, AF-70 or approved equal.

G. Fasteners: Stainless steel, or to match the sheet metal being fastened.

H. Glass Cloth: Open mesh glass fabric coated on each side with plasticized asphalt.

1. Produce: Karnak Corporation.

I. Asphalt Cement: Federal Specifications SS_C153B, Type 1, asbestos free grade.

J. Exterior mounted gutters: 7 inch wide, .050 thick aluminum with factory finished Kynar 500 finish. Box style gutters as manufactured by Garrety Gutters, 800 628 5849. Support with concealed aluminum fascia brackets spaced 12 inches O.C. fastened with 1-1/2 inch long stainless steel screws. See drawings for gutter locations.

K. Exterior Mounted Leaders and Straps: Aluminum .027 inch thick rectangular currugated leaders factory finished with baked acrylic enamel. Fasten with 1/16 inch x 1" wide straps spaced 7 feet o.c.

L. Downspout boots: Provide for ALL new leader locations. See Spec Section 05 5100.

M. Sealant: High performance, solvent free, formulated and moisture curing silyl-terminated polyether sealant, ASTM C-920, Type S, Grade NS, Class 25, NovaLink construction sealant by ChemLink, color as selected.

N. PVC coated metal: PVC coated, heat weldable sheet metal consisting of 25 gauge G90 galvanized steel factory coated with 20 mils of PVC membrane on the finished side, color as selected by Architect from manufacturers full line including metallics.

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
   1. Accurately reproduce the details and design shown, and form the profiles, bends and intersections, sharp, true and even. Fabricate sheet metal in the shop whenever possible, and form joints, laps, splices and connections to shed water and condensation in the direction of flow.
   2. Provide any miscellaneous flashing and sheet metal work not shown on the drawings but otherwise needed to leave the project complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner

B. Fabricate and install copper work in accordance with the current edition of "Copper and Common Sense" published by the Revere Copper and Brass Company, unless otherwise indicated

C. Fabricate cleats of same material as sheet, minimum 1" inches (25 mm) wide, interlocking with sheet.

D. Form pieces in longest possible lengths.

E. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

F. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

G. Tin edges of copper sheet to be soldered. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.

H. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.

I. Cap Flashings: Fabricate new cap flashings built into masonry walls properly joined to all related materials in a watertight manner. Form all seams in the new flashings, except sealant filled expansion seams, to overlap approximately 2 inches; secure the seams with rivets spaced 1 inch on center, and sweat solder them.
   1. Form 2 inch wide flat locked sealant filled expansion seams 32 feet on center.
   2. Install new cap flashings where shown on the drawings, and above all coping, gravel stop, and through-wall flashing terminations.
   3. Form new cap flashing built into masonry to turn up 2 inches minimum inside the wall, and finish with a hem on the bottom exposed edge.
   4. Lap new cap flashing under fabric type wall flashing, where existing. Where it is not possible to obtain the proper lap to shed water, install a ply of glass cloth set in and coated with plastic cement to insure a watertight connection of the new cap flashing to the existing wall flashing. In the

absence of existing wall flashings, or at solid masonry walls, turn up the new cap flashing 2 inches behind the first wythe of masonry.

5. Fabricate new cap flashings on flat roof equipment curbs from .040 inch thick aluminum, to extend 2 inches under the equipment, 4 inches over the base flashing, and finish with a 1/2 inch hem on the bottom edge. Install a 1/2 inch thick by 2 inch wide continuous foam gasket between the cap flashing and equipment. Do not set the equipment in sealant. Secure the equipment to its curb with stainless steel screws spaced 12 inches on center

J. Through Wall Flashing: Fabricate new through wall flashings to extend the entire width of the masonry wall, turn down 3/4 inch on the exterior and 4 inches with a 1/2 inch hem on the interior.

1. Set through wall flashings on a skim coat of mortar used to level the wall.
2. Form all seams, except sealant filled expansion seams, in the through wall flashing to overlap 2 inches. Secure the seams with rivets spaced 1 inch apart and sweat solder the joint.
3. Form 2 inch wide flat locked sealant filled expansion seams 32 feet on center.
4. Install stainless steel dowels through the new through wall flashings, positioned so that each piece of coping will be secured with a minimum of two dowels.
5. Pre-tin the dowels, and solder the dowels to the through wall flashing to form a watertight seal, before the copings are re-installed

K. Gravel Stop: Fabricate new gravel stops from copper, with 4 inch wide nailing flanges. Secure the gravel stop with a continuous hook strip and by nailing the flange 4 inches apart along the raw edge with roofing nails. Form joints in the gravel stop with a 5 inch wide under plate set in a full bed of sealant. Form the gravel stop to turn up 6 inches at rising walls, extend the stripping up the wall and terminate it under a cap flashing

L. Fascia: Fabricate new metal fasciae to hook onto the wood fasciae 3/4 inch minimum. Secure the fascia with roofing nails along the top edge spaced 8 inches apart, positioned to be covered by the drip edge. Form joints in the fascia with 5 inch wide concealed under plates.

PART 3 EXECUTION

3.1 GENERAL

A. Accurately reproduce the details and design shown, and form profiles, bends and intersections, sharp, true and even. Fabricate sheet metal in the shop whenever possible, and form joints, laps, splices and connections to shed water and condensation in the direction of flow.

B. Provide any miscellaneous flashing and sheet metal work not shown on the drawings but otherwise needed to leave the project complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

3.2 INSPECTION

A. Examine surfaces to receive work of this section and report any defects to the Owner. Commencement of work will be construed as complete acceptance of surfaces.

3.3 INSTALLATION

A. Fabricate and install copper work in accordance with the current edition of "Copper and Common Sense" as published by the Revere Copper and Brass Company, unless otherwise indicated.

1. Form all joints, except loose locked sealant filled expansion joints, to overlap 2 inches.
2. Secure the joints with rivets spaced 1 inch on center positioned about 1/2 inch from the top edge of the joint, then sweat solder the joint.
3. Use solder only to fill and seal the joint, not for mechanical strength. Form soldered joints continuous, strong and free from defects, with well heated soldering irons. Do not use open flame torches for soldering.
4. Clean soldered joints daily, immediately after soldering, by washing them with soap and water applied with a soft bristle brush, then rinsing with clear water.

B. Securely fasten and anchor all work, and make provisions for thermal expansion. Submit details of expansion joints for approval. Install fasteners through one edge of metal only, use a hook strip on the other edge.

C. Use stainless steel pin Zamac type nail-in fasteners, or stainless steel screws and washers with neoprene inserts where fasteners will be exposed.

3.4 CAP FLASHINGS

A. Install new copper cap flashings built into masonry walls properly joined to all related materials in a watertight manner.
   1. Solder all joints in the new cap flashing, except form 2 inch wide flat locked sealant filled expansion joints a maximum of 32 feet on center.
   2. Form the cap flashing to extend 2 inches under the equipment or skylight, 4 inches over the base flashing, and finish with a 1/2 inch hem on the bottom edge.
   3. Fasten the top edge of the cap flashing to the backup wall / masonry 12 inches on center.
   4. Install the new cap flashing under flexible type wall flashings where possible. Where it is not possible to lap the new cap flashing under an existing wall flashing, install a ply of glass cloth set in and coated with asphalt cement to connect the new cap flashing to the existing wall flashing.
   5. In the absence of an existing wall flashing, or at a solid masonry wall, turn up the new cap flashing 2 inches behind the first wythe of masonry.
   6. Install new cap flashings where shown on the drawings, and at a height of 10 to 12 inches above the roof surface.
   7. Install new zinc tin coated copper cap flashings on skylight and equipment curbs.
   8. Install a 1/2 inch thick by 2 inch wide continuous foam gasket between the cap flashing and mechanical equipment or skylight. Do not set the equipment or skylight in sealant.
   9. Secure the equipment or skylight to the curb with stainless steel screws spaced 12 inches on center.

3.5 DRIP EDGES

A. Fabricate drip edges to extend 1-1/2 inches past the roof edge, and turn down to ensure water cannot track back and run down the fascia. Secure the drip edge with roofing nails along the top edge, spaced 4 inches apart along the raw metal edge. Form joints in the drip edge with 6 inch wide concealed under plates which duplicate the profile of the drip edge. Set the underplates in a full bed of sealant.

3.6 HOOK STRIPS

A. Form continuous hook strips with locks that engage the superimposed trim piece a minimum of 3/4 inch, and to cover the entire underside edge of the wood blocking and neatly extend to the building wall.

B. Fasten hook strips along their bottom edge, just above the 45 degree bend, with nails spaced 4 inches on center into underlying wood blocking; Zamac type nail-in type fasteners spaced 8 inches on center into masonry surfaces, or screws spaced 8 inches on-center into sheet metal surfaces.

3.7 FASCIA

A. Fabricate new fascia to engage the hook strip 3/4 inch minimum and extend to the top of the wood fascia blocking. Secure the fascia with a continuous hook strip along the bottom edge and roofing nails along the top edge spaced 8 inches apart, positioned to be covered by the roof edge trim. Form joints in the fascia with 6 inch wide concealed under plates which duplicate the profile of the fascia. Set the underplates in a full bed of sealant.

3.8 ROOF EDGE SYSTEM

A. Install a factory fabricated roof edge system on all roof eaves.
   1. Extend the EPDM roof lapped over and down the face of the fascia trim, so it stops just short of the bottom edge of the anchor bar.
   2. Install the anchor bar straight, level and true, set in a full bed of sealant, and secure the bar with #9 by 2 inch long stainless steel screws spaced no more than 12 inches apart.

3. Pre-drill screw holes in the underlying metal fascia trim, and where extra fasteners are needed, and at corners and special conditions.
4. Install color matching under plates at each joint in the roof edge trim; set the under plates in a full bed of sealant.

3.9 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Conduct an inspection of the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.

B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. At least twice a day; at noon and at the end of the work day, clean up all litter, refuse, rubbish, scrap materials and debris so the roof and site presents a neat, orderly and workmanlike appearance. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.

F. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

END OF SECTION

SECTION 07 7100
ROOF SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, gravel stops, and vents.

B. Roof control and expansion joint covers.

1.2 RELATED REQUIREMENTS

A. Section 07 7200 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

E. NRCA (RM) - The NRCA Roofing Manual; 2023.

F. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

H. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2011.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two appropriately sized samples of coping and gravel stop.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with 1 details.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. By Roofing Manufacturer.
   2. W.P. Hickman Company; PermaSnap 2 Coping: www.wph.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Control and Expansion Joint Covers:
   1. Johns Manville: www.jm.com.
   2. MM Systems Corp: www.mmsystemscorp.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

C. Pipe and Penetration Flashings:
   1. Portals Plus: www.portalsplus.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration: Fascia, cant, and edge securement for roof membrane.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
   3. Material: Extruded aluminum, 0.08 inch (2.0 mm) thick, minimum.
   4. Color: To be selected by Architect from manufacturer's full range including metallics.

B. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
   3. Material: Formed aluminum sheet, 0.063 inch (1.6 mm) thick, minimum.
   4. Color: To be selected by Architect from manufacturer's standard range.

C. Control and Expansion Joint Covers: Composite construction of wide flexible EPDM flashing of black color with closed cell urethane foam backing, each edge seamed to aluminum sheet metal flanges, designed for nominal joint width of 1 inch (25 mm). Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.

2.3 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

2.4 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Conform to NRCA (RM) drawing details as noted:

E. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

F. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Rooftop mounted guardrails.

B. Gas line and equipment supports.

C. Roof hatches, manual and automatic operation, including smoke vents.

D. Non-penetrating pedestals.

E. Duct and pipe supports.

F. Roof walkway pads.

1.3 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications for roof equipment supports.

B. Section 06 1010 - Roof Related Rough Carpentry

C. Section 07 5419 - PVC Roofing

D. Section 07 5010 - Modifications to Existing Roofing

E. Section 076200 - Sheet Metal Flashings and Specialties.

F. Plumbing Divisions 22 for roof drains.

G. Mechanical Division 23 for equipment.

H. Electrical Divisions 26 for associated Electrical work.

1.4 CODE REQUIREMENTS

A. Refer to 01 4100 - Regulatory Requirements.

1.5 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

C. 29 CFR 1926.502 - Fall protection systems criteria and practices; Current Edition.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Submit the following items in advance to obtain approval prior to performing any work.

C. Product Data: Manufacturer's on each product to be used all technical data sheets required for this project .Incomplete submittals will not be reviewed.

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.

3. Installation methods.
4. Maintenance requirements.

D. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
1. Coordinate with other prime contractor (s) for roof accessories provided by them and installed by the General Contractor.

E. Samples: Submit samples when requested.

F. Samples of the Contractor's and Manufacturer's guarantee/warranty forms.

G. Warranty Documentation:
1. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.
2. Submit certification from roofing manufacture that existing warranty remains in effect,

1.7 QUALITY ASSURANCE

A. Standards: Comply with SMACNA "Architectural Sheet Metal Manual" fabrication details and "NRCA Roofing and Waterproofing Manual" installation details unless otherwise indicated.

B. Manufacturer Qualifications: Provide each primary product, produced by a single Manufacturer, which has produced that type product successfully for not less than five (5) years which has manufactured the same product in the United States of America for not less than 5 continuous years.

C. Installer Qualifications: A firm with not less than five (5) years of successful experience installing specialties similar to those required for this project employing personnel skilled in the work specified.
1. The Installer shall provide a reference list of at least three completed projects of comparable size and similar design, within a fifty mile radius of this project.
2. Provide name address, telephone number of Owner, Architect, and Construction Manager

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store products under cover and elevated above grade.

D. Do not overload the structure when storing materials on the roof.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year Contractor's warranty for that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Substaintial Completion..
1. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, undue expansion, peeling paint.
2. Guarantee coverage shall have no dollar limit.
3. Contractor's Guarantee covers "all work performed" when a single contractor/installer is awarded work specified in multiple Sections.

C. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Performance Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee

D. The Guarantee shall be issued no more than 30 days after approval of the punch list work.

E. The Guarantee shall include the removal and replacement of items or materials installed with the roof specialties as part of the original work, if removal is needed to effect guaranteed repairs.

PART 2 PRODUCTS

2.1 ROOF CURBS

A. Provided by HVAC Contractor and installed by General Contractor. Refer to HVAC drawings.

2.2 ROOFTOP MOUNTED GUARDRAILS

A. Rooftop Mounted Guardrails Manufacturers: Basis of Design
   1. Bilco Co. New Haven, CT. 800 366 6530.
      a. Bil_Guard 2.0 Roof Guard Hatch Railing System
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Rooftop Mounted Guardrails:
   1. Provide top and mid railings that comply with 29 CFR 1910.29.
   2. Structural Load: 200 lb (90.7 kg), minimum, in any direction with components in compliance with 29 CFR 1926.502.
   3. Height: 42 inches (1067 mm), minimum.
   4. Railings: 1-5/8 inches (41.3 mm) minimum outside diameter, hot-rolled, welded tubing, free of sharp edges and snag points.
   5. Steel Surface Finish: Hot-dip zinc galvanized, with color of safety yellow.

2.3 ROOF HATCHES AND VENTS

A. Roof Hatch Manufacturers:
   1. Bilco Company; S-50TB: www.bilco.com.
   2. Substitutions: See Section 01 2500 Substitution Procedures.

B. Roof Hatches : Factory-assembled aluminum frame and cover, complete with operating and release hardware.
   1. Style: Provide flat metal covers unless otherwise indicated.
   2. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.
   3. Thermally Broken Hatches: Provide insulation within frame and cover.
   4. For Ladder Access: Single leaf; 30 by 36 inches (762 by 914 mm).

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch (2.3 mm) thick.
   2. Insulation: Manufacturer's standard; 3 inch (76 mm) rigid glass fiber, located on inside hollow curb.
   3. Curb Height: 12 inches (305 mm) from finished surface of roof, minimum.

D. Metal Covers: Flush, insulated, hollow metal construction.
   1. Capable of supporting 40 psf (1.92 kPa) live load.
   2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch (2.3 mm) thick, liner 0.04 inch (1.0 mm) thick.
   3. Insulation: Manufacturer's standard 3 inch (76 mm) rigid polyisocyanurate.
   4. Gasket: EPDM, continuous around cover perimeter.

E. Safety Railing System: Roof hatch safety rail system mounted directly to curb without penetration of roofing system.
   1. Railing Size: As indicated on drawings.
   2. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.
   3. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
   4. Posts and Rails: Aluminum tubing.

5. Gate: Same material as railing; automatic closing with latch.
6. Finish: Manufacturer's standard, factory applied finish. Hi-vis safety yellow
7. Fasteners: Stainless steel, Type 316.
8. Products:
   a. BILCO Company; Bil-Guard 2.0: www.bilco.com.

F. Hardware: Type 316 stainless steel, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior and exterior.
6. Locking: Padlock hasp on interior.

2.4 ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly. Provided and installed by HVAC contractor. General Construction Contractor shall provide roof pads.

B. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
1. Bases: High density polypropylene.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
4. Products:
   a. Portals Plus; Pedestal Plus: www.portalsplus.com.

2.5 CAST IRON ROOF DRAIN ASSEMBLIES

A. Refer to Plumbing Specifications Division 22. Coordinate type with roof system.

2.6 ROOF WALKWAY PADS

A. 2 inches thick, 24 inches by 24 inches precast concrete pavers, natural buff color and finish, minimum 7500 psi compressive strength as manufactured by Hanover Architectural Products, Co., Inc. or approved equal.
1. Provide where shown on drawings.

B. 30 inches by 30 inches hard rubber walkway pads, color; black, as manufactured by Firestone or equal.
1. Provide under all pedestal supports and concrete pads and where shown on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

B. Coordinate all work interfacing with mechanical and electrical contracts with respective contractors.

C. Roof Hatches and Safety Railings:
   1. Install in accordance with manufactures recommendations and as follows:
      a. Coordinate blocking and insulation thickness to maintain top of curb 12" above finished surface of roof.
      b. Coordinate hatch opening orientation with ladder below.
      c. Install safety railing system to curb without penetrating flashings in accordance with manufacturer's requirements.

D. Cast Iron Roof Drain Assemblies (Provided by Plumbing Contractor)
   1. Install roof drains as per manufacturer's recommendations. as follows:
      a. Install the drain at a recessed elevation to achieve maximum drainage. Support the drain with a stamped sump drain receiver, secure it with an under deck clamp and patch the deck around the new drain as needed.

E. Roof Walkway Pads
   1. Install concrete pavers over a piece of hard rubber walkway pad spaced 5 feet on center for conduit supports.
   2. Install walkway pad for walkways to provide a path 2-1/2 feet wide, where shown on the Drawings, adhered to the membrane surface with 5 strips of peel and stick SeamTape, and at all roof access points, i.e., doors, ladders and hatches, and under all concrete pavers used for conduit supports

3.4 MISCELLANEOUS

A. Provide and install any sealants needed, where shown or required.

B. Provide new material, couplings, transition pieces, blocking, fasteners and the similar accessories needed to complete the work.

C. Adjust safety railing gate to provide positive closure and latching in conformance to OSHA and CPSC requirements.

3.5 CLEANING

A. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work

B. Clean installed work to like-new condition.

3.6 PROTECTION

A. Protect existing and new roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

B. Protect installed products until completion of project.

C. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8100
APPLIED FIREPROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fireproofing of interior structural steel beams, columns., and decking.

1.3 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing.

B. Section 05 2100 - Steel Joist Framing.

C. Section 05 3100 - Steel Decking.

D. Section 07 8400 - Firestopping.

1.4 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

B. ASTM E119 - Standard Methods of Fire Tests of Building Construction and Materials

C. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

D. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2017.

E. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members; 1992, with Editorial Revision (2015).

F. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

G. ASTM E761/E761M - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members; 1992, with Editorial Revision (2015).

H. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members; 2023.

I. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

K. Underwriters Laboratories Inc. (UL) Fire Resistance Directory (Latest Edition)
   1. UL/ANSI 263 Fire Tests of Building Construction Materials

L. UL (FRD) - Fire Resistance Directory; Current Edition.

M. National Fireproofing Contractors Association
   1. NFCA 100 - Standard Practice for Application of Spray-Applied Fire Resistive Materials (SFRMs)
   2. NFCA 200 - Field Quality Assurance Procedures Pertaining to the Application of SFRMs

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.6 DEFINITIONS

A. Aggregate slurry Fireproofing as defined by Underwriters Laboratories Inc. (CHPX) in the latest edition of the UL Fire Resistance Directory

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, for:

1. Bond Strength per ASTM E736
2. Bond Impact per ASTM E759 .
3. Compressive Strength per ASTM E761 .
4. Fire tests using substrate materials similar those on project.
5. Air Erosion per ASTM E859
6. Corrosion Resistance per ASTM E937
7. Abrasion Resistance (Test Method developed by City of San Francisco, Bureau of Building Inspection)
8. Impact Penetration (Test Method developed by City of San Francisco, Bureau of Building Inspection)
9. High Speed Air Erosion per ASTM E859
10. Deflection
11. Bond Impact per ASTM E760
12. Surface Burning Characteristics per ASTM E84
13. Combustibility per ASTM E1354 Cone Calorimeter

D. Fire Testing: Submit evidence that the aggregate slurry fireproofing has been subjected to full-scale UL 263/ASTM E119 fire testing at Underwriters Laboratories Inc., or an other accredited laboratory, by the manufacturer

E. Thickness Schedule: Provide schedule indicating material to be used, structural elements to be protected with spray applied fireproofing, hourly rating and material thickness provided and appropriate references.

F. Mold Resistance per ASTM G21

G. Manufacturer's Installation Instructions: Indicate special procedures.

H. Manufacturer's Certificate: Certify that sprayed-on fireproofing products meet or exceed requirements of contract documents.

I. Manufacturer's Field Reports: Indicate environmental conditions under which fireproofing materials were installed.

J. Manufacturer's Qualification Statement.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, and:

1. Having minimum 3 years of documented experience.
2. Approved by manufacturer.

C. Products, execution, and fireproofing thicknesses shall conform to the applicable code requirements for the required fire-resistance ratings.

D. Contractor, fireproofing subcontractor and independent testing laboratory shall attend a pre-installation conference to review the substrates for acceptability, method of application, applied thicknesses, inspection procedures and other issues.

1.9 MOCK-UP

A. Construct mock-up, 100 square feet (9 square meters) in size.

B. Conform to project requirements for fire ratings.

C. Locate where directed.

D. Examine installation within one hour of application to determine variances from specified requirements due to shrinkage, temperature, and humidity.

E. Where shrinkage and cracking are evident, adjust mixture and method of application as necessary. Remove materials and re-construct mock-up.

F. Mock-up may remain as part of the Work.

1.10 FIELD CONDITIONS

A. Do not apply spray fireproofing when temperature of substrate material and surrounding air is below 40 degrees F (4 degrees C) or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

1.11 SEQUENCING AND SCHEDULING

A. Sequence and coordinate application of aggregate slurry fireproofing with work in other sections which would interfere with efficient fireproofing application.

1.12 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sprayed-On Fireproofing:

1. Isolatek International. Product: Cafco 300. 800-631-9600

2.2 FIREPROOFING ASSEMBLIES

A. Provide assemblies as indicated on drawings.

2.3 MATERIALS

A. Sprayed Fire-Resistive Material Interior Locations, Concealed Conditions: Manufacturer's standard factory mixed material, which when combined with water is capable of providing the indicated fire resistance, and conforming to the following requirements:

1. Bond Strength: 150 pounds per square foot (7.2 kPa), individual minimum and minimum average bond strength of 200 psf, when tested in accordance with ASTM E736 when set and dry.
2. Dry Density: Minimum average density of 15 lb/cu ft (240 kg/cu m), with minimum individual density of any test sample of 14 lb/cu ft (224 kg/cu m), when tested in accordance with ASTM E605/E605M.

3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm)
4. Compressive Strength: 1,453 pounds per square inch (10 kPa), minimum when tested in accordance with ASTM E761.
5. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
6. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
7. Air Erosion Resistance: Weight loss of 0.00g/sq ft, maximum, when tested in accordance with ASTM E859 after 24 hours. Sample surface shall be “as applied” (not pre-purged) and the total reported weight loss shall be the total weight loss over a 24 hour period from the beginning of the test.
8. High Speed Air Erosion: Materials to be used in plenums or ducts shall exhibit no continued erosion after 4 hours at an air speed of 2500 ft/min (29 mph) when tested per ASTM E859.
9. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
10. Effect of Deflection: No cracking, spalling, or delamination, when tested in accordance with ASTM E759/E759M.
11. Corrosion Resistance: Fireproofing applied to steel shall be tested in accordance with ASTM E937 and shall not promote corrosion of steel.
12. Mixing water shall be clean, fresh, and suitable for domestic consumption and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material. Provide water with sufficient pressure and volume to meet the fireproofing application schedule.
13. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.

2.4 ACCESSORIES

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated

B. Provide accessories to comply with manufacturer’s recommendations and to meet fire resistance design and code requirements. Such accessories include, but are not limited to, any required or optional items such as Spatterkote SK-3; bonding agents, mechanical attachments; application aids such as metal lath, scrim, or netting; and Monokote Accelerator.

C. Primer Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
   1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

D. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

E. Water: Clean, potable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

F. All surfaces to receive spray applied fireproofing shall be provided free of oil, grease, loose mill scale, dirt or other foreign substances which may impair proper adhesion of the fireproofing to the substrate. Where necessary, cleaning or other corrections of surfaces to receive fireproofing shall be the responsibility of the supplier of the incompatible surface.

G. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

H. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application

I. Verify that concrete work on steel deck has been completed before beginning fireproofing work.

J. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

K. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

L. Application of the fireproofing shall not begin until the contractor, applicator and fireproofing testing laboratory (inspector) have examined surfaces to receive fireproofing and determined that the surfaces are acceptable to receive the fireproofing material.

3.2 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in situations where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could affect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

E. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

F. Verify other trades have installed clips, hangers, support sleeves and other attachments required to penetrate the fireproofing, prior to application of the fireproofing materials.

G. Other trades shall not install ducts, piping, equipment or other suspended items until the fireproofing is complete.

H. Complete placing of concrete on floor and roof decking prior to application of the fireproofing to the underside of steel deck and supporting beams and joists.

I. On roof decks without a concrete cover, complete all roofing applications and roof mounted equipment installation prior to application of the fireproofing to the underside of roof decking and supporting beams and joists. Prohibit all roof traffic upon commencement of the fireproofing and until the fireproofing material is dry.

J. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application

K. Protection of permanently exposed walls or floors, or special surfaces:

L. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

M. Close off and seal duct work in areas where fireproofing is being applied.

3.3 APPLICATION

A. Equipment and application procedures shall conform to the material manufacturer's application instructions.

B. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

C. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

D. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

E. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

F. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

G. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.

H. Post appropriate cautionary "Slippery When Wet" signs in all areas in contact with wet fireproofing material. Erect appropriate barriers to prevent entry by non-fireproofing workers into the fireproofing spray and mixing areas and other areas exposed to wet fireproofing material.

I. Apply a discontinuous textured spray of Spatterkote SK-3 in accordance with manufacturer's instructions to all cellular steel floor units with flat plate on the bottom and to roof deck assemblies as required to meet the fire resistance ratings, before application of the Monokote fireproofing to these surfaces

J. Apply fireproofing in accordance with manufacturer's instructions.

K. Apply fireproofing in thickness and density necessary to achieve required ratings, with uniform density and texture.

L. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer.

M. The contractor shall follow the application provisions and the field application quality control provisions of NFCA 100 - Standard Practice for Application of Spray-Applied Fire Resistive Materials (SFRMs) and NFCA 200 - Field Quality Assurance Procedures Pertaining to the Application of SFRMs.

N. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

O. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

P. Extend fireproofing in full thickness over entire area of each substrate to be protected.

Q. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer

R. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

S. Cure fireproofing according to fireproofing manufacturer's written recommendations.

T. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications

U. Finishes: Where indicated, apply fireproofing to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.

2. Spray-Textured Finish: Finish left as spray applied with no further treatment.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect the installed fireproofing after application and curing for integrity, prior to its concealment. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of the Authority Having Jurisdiction.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Re-inspect the installed fireproofing for integrity of fire protection, after installation of subsequent Work.

E. The Owner will retain and pay for an independent testing laboratory to randomly sample and verify the thickness and the density of the fireproofing in accordance with provisions of ASTM E605, or the "Inspection Procedure for Field-applied Sprayed Fire Protection Materials" as published by the Association of Wall and Ceiling Contractors International (AWCI), or the Uniform Building Code Standard No. 7-6. Fireproofing density samples should be tested in accordance with the displacement method in ASTM E605 to determine in-place fireproofing density.

F. The Owner will retain and pay for an independent testing laboratory to randomly sample and verify the bond strength of the fireproofing in accordance with provisions of ASTM E736.

1. Fireproofing will be considered defective if it does not pass tests and inspections.
    a. Remove and replace fireproofing that does not pass tests and inspections, and retest.
    b. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest

G. The results of the above tests shall be made available to all parties at the completion of pre-designated areas which shall have been determined during the pre-job conference.

3.5 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

C. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.

D. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

E. Repair fireproofing damaged by other work before concealing it with other construction.

F. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product

G. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not.

B. Speed strips & plugs.

C. Flexible sealant.

D. Joint spray.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.4 REFERENCE STANDARDS

A. ASTM C1241 - Average volume shrinkage: 51.1%

B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

C. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

D. ASTM E 90-99 - Sound Transmission Classification; 59 per tested construction.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015.

G. FM 4991 - Approval Standard for Firestop Contractors; 2013.

H. FM (AG) - FM Approval Guide; current edition.

I. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

1.6 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD) or FM (AG) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:

1.7 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Install one firestopping assembly representative of each fire rating design required on project.

1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.

C. If accepted, mock-up will represent minimum standard for this work.

D. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

1.8 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Firestopping Manufacturers:

1. Hilti Firestop Systems Hilti, Inc. (U.S.) 1-800-879-8000 www.us.hilti.com • en español 1-800-879-5000 • P.O. Box 21148, Tulsa.

2.2 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.3 SYSTEMS

A. Gypsum Board Walls:

1. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
   a. 1 Hour Construction: UL System WW-D-0067; **Hilti CP 606** Flexible Firestop Sealant.
2. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
   a. 1 Hour Construction: UL System HW-D-0049; Hilti **CFS-SP WB** Firestop Joint Spray and CP 672.
3. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Cut to Fit Ribs:
   a. 1 Hour Construction: UL System HW-D-0045; Hilti **CP 606** Flexible Firestop Sealant.
4. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Not Cut to Fit:
   a. 1 Hour Construction: UL System HW-D-0042; Hilti **CFS-SP WB** Firestop Joint Spray and CP 672.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.4 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Acoustical sealant.

D. Joint backings and accessories.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 07 2500 - Weather Barriers: Sealants required in conjunction with water-resistive barriers.

C. Section 07 8400 - Firestopping: Firestopping sealants.

D. Section 07 9513 - Expansion Joint Cover Assemblies: Sealants forming part of expansion joint cover assemblies.

E. Section 08 6200 - Unit Skylights

F. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.

G. Section 08 8000 - Glazing: Glazing sealants and accessories.

H. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

I. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.4 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.

6. Sample product warranty.
7. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

F. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

G. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

H. Executed warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
1. Identification of testing agency.
2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
   a. Test date.
   b. Copy of test method documents.
   c. Age of sealant upon date of testing.
   d. Test results, modeled after the sample form in the test method document.
   e. Indicate use of photographic record of test.

E. Field Quality Control Plan:
1. Visual inspection of entire length of sealant joints.

F. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Brewster Central School District.
6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches (457 mm) long.

2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch (25.4 mm) by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Brewster Central School District's name and register with manufacturer.

1.8 MOCK-UP

A. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
1. Bostik Inc: www.bostik-us.com.
2. Dow Corning Corporation: www.dowcorning.com/construction.
3. Pecora Corporation: www.pecora.com.
4. Sika Corporation: www.usa-sika.com.
5. W.R. Meadows, Inc: www.wrmeadows.com/sle.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
1. Pecora Corporation: www.pecora.com.
2. Sika Corporation: www.usa-sika.com.
3. W.R. Meadows, Inc: www.wrmeadows.com.

2.2 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
a. Wall expansion and control joints.
b. Joints between door, window, and other frames and adjacent construction.
c. Joints between different exposed materials.
d. Openings below ledge angles in masonry.
e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
a. Joints between door, window, and other frames and adjacent construction.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Interior Vertical Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.3 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 01 6116.

2.4 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   5. Color: To be selected by Architect from manufacturer's full range.
   6. Cure Type: Nuetral.
   7. Service Temperature Range: Minus 20 to 180 degrees F (Minus 29 to 82 degrees C).
   8. Manufacturers:
      a. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com.
      b. Sika Corporation; Sikasil 728NS: www.usa-sika.com.

B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's full range.
   4. Cure Type: Single-component, neutral moisture curing
   5. Service Temperature Range: Minus 65 to 180 degrees F (Minus 54 to 82 degrees C).
   6. Manufacturers:
      a. Pecora Corporation; Pecora 860: www.pecora.com.
      b. Sika Corporation; Sikasil 728NS: www.usa-sika.com.
      c. Substitutions: 01 2500 - Substitution Procedures.

C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Applications: Use for:
      a. All perimeter joints of toilet fixtures, cabinets, casework, countertops and similar locations.
   3. Manufacturers:
      a. 786 Mildew Resistant; Dow Corning.
      b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology):: www.pecora.com.
      c. Sika Corporation; Sikasil GP: www.usa-sika.com.
      d. Sanitary 1700; GE Silicones..

D. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: To be selected by Architect from manufacturer's full range.
   3. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).

4. Manufacturers:
   a. Pecora Corporation; Dynatrol II;: www.pecora.com.
   b. Sika Corporation; Sikaflex-1a: www.usa-sika.com.
5. Applications: Use for:
   a. All exterior and interior vertical joints.
6. Substitutions: 01 2500 - Substitution Procedures.

E. Type Acoustical Sealant: - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-hardening, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's full range.
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
3. Manufacturers:
   a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: www.pecora.com.
4. Applications: Use for:
   a. Use for all interior joints of where acoustical sealant indicated.
5. Substitutions: 01 2500 - Substitution Procedures

2.5 SELF-LEVELING SEALANTS

A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range.
4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
5. Manufacturers:
   a. Pecora Corporation; Pecora 300 SL (Self-Leveling): www.pecora.com.
   b. Sika Corporation; Sikaflex 1c SL: www.usa-sika.com.
   c. Use for all horizontal exterior joints and interior joints in wet areas..

B. Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M, and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range.
4. Tensile Strength: 200 to 250 psi (1.38 to 1.72 MPa) in accordance with ASTM D412.
5. Manufacturers:
   a. Pecora Corporation; DynaTrol II-SG (Slope Grade): www.pecora.com.

2.6 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
3. Open Cell: 40 to 50 percent larger in diameter than joint width. (Not to be used in flat or horizontal joints)
4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width. (Use for flat and horizontal joints)

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.

1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
3. Record each test on Preinstallation Adhesion Test Log as indicated.
4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.3 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Self-leveling joints: Recess joint depth as recommended by the sealant manufacturer.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 07 9513
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Expansion joint cover assemblies for floor, wall, ceiling, and floor to wall surfaces.

1.3 RELATED REQUIREMENTS

A. Section - Cast-in-Place Concrete: Expansion and contraction joints in walls and concrete floors.

B. Section 04 2000 - Unit Masonry: Placement of joint cover assembly frames in masonry.

C. Section 09 2116 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.

D. Section 09 5100 - Acoustical Ceilings: Expansion joint assemblies in suspended ceiling grids.

1.4 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.

D. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Floor Joints Subject to Thermal Movement:
   1. Products:
      a. The C/S Group SJPFRM-100/FB
      b. The C/S Group VF-100

B. Expansion Joints: Provide expansion joints for Unglazed Porcelain Tile on each column line and as recommended by the TCA Handbook for the installation reference EJ171-04 manufacturer.
   1. Schluter Dilex as manufactured by Schluter Systems.
      a. PVC anchor legs and side sections, with chlorinated polyethylene sealant

C. Interior Non-Rated Floor/Wall Joints:
   1. Product:
      a. ASMC-W/B.

D. Interior Rated Wall Joints:
   1. Product:
      a. ASM-100 -W/FB.

2.3 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Joint Dimensions and Configurations: As indicated on drawings.
   2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.
   1. If floor covering is not indicated, obtain instructions from Construction Manager before proceeding.

C. Covers in Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.

D. Colors: As selected by the architect from the manufacturers full range.

2.4 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.

B. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.2 PREPARATION

A. Install anchoring devices in conformance to templates.

3.3 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.4 PROTECTION

A. Provide strippable coating to protect finish surface.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fire-rated hollow metal doors and frames.

B. Embossed Doors

C. Thermally insulated hollow metal doors with frames.

D. Hollow metal borrowed lites glazing frames.

E. Accessories, including glazing.

1.3 RELATED REQUIREMENTS

A. Section 08 1613 - Fiberglass Doors and Aluminum Frames.

B. Section 08 7100 - Finish Hardware.

C. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

D. Section 09 9123 - Interior Painting: Field painting.

1.4 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. NAAMM: National Association of Architectural Metal Manufacturers.

C. NFPA: National Fire Protection Association.

D. UL: Underwriters Laboratories.

1.5 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

F. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

G. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.

H. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

D. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Basis of Design: Steelcraft, an Allegion brand 11819 N. Pennsylvania St. Carmel, IN 46032; Toll Free Tel: 877-578-1247: www.allegion.com/us.
   2. Assa Abloy Ceco: www.assaabloydss.com.
   3. Substitutions: See Section 01 2500 Substitution Procedures.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for all Doors and Frames:
   1. Accessibility: Comply with ICC A117.1 and ADA Standards.
   2. Door Top Closures: Flush end closure channel, with top and door faces aligned.
   3. Door Edge Profile: Beveled.
   4. Typical Door Face Sheets: Flush.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
      a. Provide 14 gauge channel reinforcing for all door closers.
      b. Provide preparation for all electrical hardware.
   7. Galvanizing for Units in Wet Areas including toilets and etc: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
   8. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 EMBOSSED WOOD GRAIN FINISH DOORS

A. Acceptable Product: Steelcraft GrainTech L Series.

B. Door Thickness: 1-3/4 inches.

C. Door faces reinforced and sound deadened as follows:
   1. Honeycomb Core: 1" cell kraft honycomb, 99 lbs., configuration to provide increased structural integrity.
   2. Sanded for maximum adhesion.
   3. Impregnated with phenolic resin.
   4. Laminate to both face sheets with contact adhesive

D. Vertical edge seams: Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges. Finish edges as follows:
   1. Visible Interlocked Edge Seam: Continuous vertical mechanical interlocking joints with visible edge seams and continuous bead of structural epoxy in internal vertical connection

E. Gauge: 16 gauge,

F. Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm). Square edges on hinge and/or lock stiles are not acceptable.

G. Reinforce top and bottom of doors with galvannealed 14 gage (1.7 mm), welded to both panels.

H. Top Caps: Sealed flush.

I. Glazing Bead: Formed steel sheet or snap-in Designer trim.

J. Fire Rating: Supply door units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

K. In addition to the requirements listed in Par 2.3 the following apply where wood grain finished are indicated:
   1. Fabricated from steel that has an embossed wood grain pattern extending the full height and width of the door. Provide a wood grain embodiment minimum .005” deep. Applied grain pattern or material is not acceptable.

L. Anchors: Manufacturer's standard framing anchors, specified in manufacturer's printed installation instructions for project conditions.

M. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings.

N. Door Bottom:
   1. Acceptable Product: Steelcraft Fas-Seal Door Bottom.
   2. Characteristics: Electrometric, continuous strip, screw-attached to recessed bottom door channel for concealed installation; double-sealing; acceptable for fire-rated doors up to 3 hour rating.

O. Plaster Guards: Same material as door frame, minimum 24 gage (0.5 mm) minimum; provide for all strike boxes.

P. Silencers: Resilient rubber, Inserted type, three per strike jamb for single openings and two per head for paired openings. Stick-on silencers shall not be permitted except on hollow metal framing systems.
   1. Provide silencers on all existing frames.

Q. Finish: Complete factory finish.

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frames Wider than 48 Inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

C. Door Frames, Fire-Rated: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
      a. Product: Steelcraft; (FE Series" Double Egress Frame" at double opposing swinging doors.) (FE Series at other rated hollow metal doors.)
   2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum. 14 gauge for opening over 4'-0".
   3. Frame Finish: Factory primed and field finished.

2.5 ACCESSORIES

A. Glazing: As specified in Section 08 8000, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08 7100.

D. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

G. Frame Anchors: Minimum of six wall anchors and two base anchors.
   1. T anchors for masonry.
   2. Clips angles for metal framing.

H. Frame Repairs:
   1. Repair dents, patch rust holes, fill in chips etc.
   2. Body Filler With Hardener.
   3. Color: Light Gray.
   4. Manufacturer: 3M Product "Bondo Body Filler 265".

2.6 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Patch existing frames as required to remove rust, dents, chips and fill holes.
   1. Apply body filler in accordance to manufacturer's instruction.
   2. Sand surfaces smooth.

3.3 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Install door hardware as specified in Section 08 7100.

D. Comply with glazing installation requirements of Section 08 8000.

E. Install perimeter foam seal in accordance with requirements specified in Section 07 9005.

1. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.
2. Cut back to permit application of joint sealant.

3.4 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

END OF SECTION

SECTION 08 1613
FIBERGLASS DOORS AND ALUMINUM FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fiberglass reinforced polyester (FRP) doors.

B. Aluminum monumental stile and rail doors

C. Aluminum Thermal Break and Non Thermal Break Frames for fiberglass reinforced polyester doors.

D. Snap trim.

E. Factory installed Finish Hardware

F. Insulated Infill panels.

G. Foam door seal.

H. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry

B. Section 08 1213 - Hollow Metal Frames.

C. Section08 7100 - Door Hardware.

D. Section 08 4413 - Glazed Aluminum Curtain Walls.

E. Section 08 8000 - Glazing.

1.4 REFERENCE STANDARDS

A. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents

D. ASTM D 570 - Water Absorption of Plastics

E. ASTM D 638 - Tensile Properties of Plastics

F. ASTM D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

G. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics

H. ASTM D 1623 - Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

I. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging

J. ASTM D 2583 - Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

K. ASTM D 5420 – Impact Resistance of Flat Rigid Plastic Specimens by Means of a Falling Weight.

L. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

N. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).

O. ASTM E 90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Q. ASTM E 283 - Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

R. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

S. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

T. ASTM F 476 - Security of Swinging Door Assemblies.

U. ASTM F 1642-04 - Standard Test Method for Glazing Systems Subject to Air blast Loading.

V. NWWDA T.M. 7-90 - Cycle Slam Test Method

W. SFBC PA 201 - Impact Test Procedures.

X. SFBC PA 203 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

Y. SFBC 3603.2 (b)(5) - Forced Entry Resistance Test.

Z. NFPA 252 - Fire Tests of Door Assemblies.

AA. UBC Standard 7-2 - Fire Tests of Door Assemblies.

AB. UL 10C - Positive Pressure Fire Tests of Door Assemblies

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.

B. Air Infiltration: For a single door 3’-0” x 7’-0”, test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.24 psf. Door shall not exceed 0.30 cfm/ft2.

C. Water Resistance: For a single door 3’-0” x 7’-0”, test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.

D. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.

E. Hurricane Test Standards, Single Door:
   1. Uniform Static Load, ASTM E 330: Plus or minus 195 pounds per square foot.
   2. Forced Entry Test, 300 Pound Load Applied, SFBC 3603.2 (b)(5): Passed.
   3. Cyclic Load Test, SFBC PA 203: Plus or minus 53 pounds per square foot.
   4. Large Missile Impact Test, SFBC PA 201: Passed.

F. Hurricane Test Standards, Pair of Doors with single point latching:
   1. Uniform Static Load, ASTM E 330: Plus or minus 112.5 pounds per square foot.
   2. Forced Entry Test, 300 Pound Load Applied, AAMA 1304: Passed.
   3. Cyclic Load Test, ASTM E 1886: Plus or minus 75 pounds per square foot.
   4. Large Missile Impact Test, ASTM E 1886: Passed.

G. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 25,000,000 cycles.

H. Cycle Slam Test Method, NWWDA T.M. 7-90: Minimum 5,000,000 Cycles.

I. Salt Spray, Exterior Doors and Frames, ASTM B 117: Minimum of 500 hours.

J. Sound Transmission, Exterior Doors, STC, ASTM E 90: Minimum of 25.

K. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503-98: Maximum of 0.29 BTU/hr x sf x degrees F. Minimum of 55 CRF value.

L. Surface Burning Characteristics, Class A Option On Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:
   1. Flame Spread: Maximum of 25.
   2. Smoke Developed: Maximum of 450.

M. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 14.0 foot-pounds per inch of notch.

N. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638: 13,000 psi.

O. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.

P. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.

Q. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.

R. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 5420: 120 in-lb.

S. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.

T. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.

U. Chemical Resistance, ASTM D 543. Excellent rating.
   1. Acetic acid, Concentrated.
   2. Ammonium Hydroxide, Concentrated.
   3. Citric Acid, 10%.
   4. Formaldehyde.
   5. Hydrochloric Acid, 10%
   6. Sodium hypochlorite, 4 to 6 percent solution.

V. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.

W. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.

X. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi.

Y. Thermal and Humid Aging, Foam Core, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change.

Z. UL 10C

1.6 FIRE RATED FRP DOORS

A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.

B. 90-Minute Full-Scale Vertical Fire Test of Doors, Positive Pressure: Complied with acceptance criteria for 90-minute rating.
   1. UBC Standard 7-2.
   2. NFPA 252.
   3. UL 10C

1.7 SYSTEM PERFORMANCE:

A. Provide Door assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below, as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated.

B. Thermal Transmission (Exterior Doors): U-value of not more than 0.09 (BTU/Hr. x sf x degrees F.) per AAMA 1503.1.

C. Ignition Barrier: Doors not requiring a fire resistance rating shall comply with the requirements of IBC-2015 Section 2603.4.1.7. Foam plastic insulation shall have a flame spread index of 75 or less and a

smoke-developed index of not more than 450. Door facings shall have a minimum thickness of 0.032" (0.8mm) aluminum sheet or steel having a base metal thickness of not less than 0.016" (0.4mm) at any point. Manufacturer may alternatively submit an evaluation and testing report from an acceptable agency, confirming testing, accordance with 2603.9, has been completed indicating compliance.

D. Thermal Barrier: Insulated panels shall conform to the requirements of IBC-2015 2603.4. Foam plastic shall be separated from the interior of a building by an approved thermal barrier of 0.5-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

1.8 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.9 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.

C. Test Reports: Show compliance with specified criteria.

D. Shop Drawings: Show layout and profiles; include assembly methods. Shop drawings to be prepared by door manufacturer.

1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
2. Indicate wall conditions, door and frame elevations, at 1/2" scale, half-sized detail sections, materials, gages, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on Drawings to identify details and openings. expansion provisions, and other components not included in the manufacturer's standard data. Include glazing details

E. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.

1. Where normal color and texture variations are expected, include two or more units in each sample to show the range of such variations.

F. Architect reserves the right to require samples of typical fabricated section, showing joints, exposed fastenings (if any), quality of workmanship, hardware and accessory items, before fabrication of the work proceeds.

G. Door Corner Sample: Submit corner cross sections, 10 inch (254 mm) by 10 inch (254 mm) in size, illustrating construction, finish, color, and texture.

H. Manufacturer's Qualification Statement.

I. Maintenance Data: Include instructions for repair of minor scratches and damage.

J. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Brewster Central School District's name and registered with manufacturer; include detailed terms of warranty.

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than ten years of documented experience.

1. Door and frame components from same manufacturer.
2. Evidence of a compliant documented quality management system.

B. Standards: Comply with the requirements and recommendations in applicable specifications and standards by NAAMM, AAMA, and AA, including the terminology definitions, and specifically including the "Entrance Manual" by NAAMM, except to the extent more stringent requirements are indicated.

C. All materials, equipment and operation supplied shall conform to all Code requirements including Accessibility for the Handicapped.

D. Installer Qualifications: Company specializing in installing products of the type specified in this section with not less than five (5) years of documented experience, and approved by the manufacturer..

E. The manufacturer shall provide a factory trained technician to visit this project and instruct the installers in the proper installation of the door and frame assemblies.

1.11 FIELD MEASUREMENT:

A. Verify field measurements prior to fabrication of doors and frames to insure proper fitting of assemblies. Successful bidders are expected to field verify all dimensions, sizes, quantities and the material required to complete this project. Failure to do so will not relieve the successful contractor from the necessity of furnishing any and all materials that my be required, without any additional costs to the Owner.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Mark doors with location of installation, door type, color, and weight.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Materials shall be inspected for damage, and the manufacturer shall be advised immediately of any discrepancies. Unsatisfactory materials are not to be used

C. Handling: Protect materials and finish from damage during handling and installation.

D. Store materials in original corrugated packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.

1. Doors shall be "floated" within cartons, with no portion of the door having contact with the outer shell of the container.
2. Store at temperature and humidity conditions recommended by manufacturer.
3. Do not use non-vented plastic or canvas shelters.
4. Immediately remove wet wrappers.
5. Store in position recommended by manufacturer, elevated minimum 4 inch (102 mm) above grade, with minimum 1/4 inch (6.4 mm) space between doors.

1.13 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Special Project Warranty:

1. Provide a written warranty signed by Manufacturer, Installer and Contractor, agreeing to replace, at no cost to the Owner, any doors or frames that fail in materials or workmanship, within the time period of acceptance, as indicated below. Failure of materials or workmanship includes excessive deflection, faulty operation of entrances, deterioration of finish, or construction, in excess of normal weathering, and defects in hardware, weather stripping, and other components of the work. In addition the manufacturer further certifies that they have factory installed all hardware and such hardware is also guaranteed not to come loose during the guarantee period.
2. Warranty Time Period: Ten Years from substantial completion.
3. In addition, a limited lifetime (while the door is in its specified application in its original installation) warranty covering: Failure due to corrosion on FRP components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Pultruded Fiberglass Reinforced Plastic (FRP) Doors:

1. Special-Lite, Inc; PO Box 6, Decatur, Michigan 49045. Toll Free (800) 821-6531. Phone (269) 423-7068. Fax (800) 423-7610. Web Site www.special-lite.com. E-Mail info@special-lite.com.: www.special-lite.com.
2. Subject to compliance with requirements, other manufacturers are acceptable:

a. Tubelite - Reed City, Michigan
b. Vista-Wall/Old Castle, Lincoln, R.I.
c. Kawneer - Norcross, Ga.

B. Fiberglass Composite Doors:
1. Special-Lite, Inc; PO Box 6, Decatur, Michigan 49045. Toll Free (800) 821-6531. Phone (269) 423-7068. Fax (800) 423-7610. Web Site www.special-lite.com. E-Mail info@special-lite.com.: www.special-lite.com.
2. Substitutions: Section 01 2500 Substitution Procedures.

C. Fire-Rated Fiberglass Doors and Frames:
1. Special-Lite, Inc; FR Series 45: www.special-lite.com/#sle.
2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 ALUMINUM DOOR FRAMES

A. General:
1. 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 and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate, with a minimum wall thickness of 0.125".
b. All materials shall be of the same manufacturer. No splitting of Door and Frame components will be permitted for aluminum frames.
c. Fasteners: Provide Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors, and other items being fastened. For exposed fasteners (if any), provide Phillips head flat head screws with finish matching the item to be fastened.
d. Do not use exposed fasteners, except where unavoidable for the assembly of units, or unavoidable for the fastening of hardware. Provide only concealed screws in glazing stops.
e. Reinforcement and Brackets: Manufacturer's standard formed or fabricated steel units, of shapes, plates, of bars, with 2.0 ounce hot-dip zinc coating, complying with ASTM A 123, applied after fabrication.
f. Expansion Anchor Devices: Lead shield or toothed steel, drilling expansion bolt anchors.
g. Bituminous Coating: Cold applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.
h. Sealants and Gaskets: Provide sealants and gaskets in the fabrication, assembly and installation of the work, which are recommended by the manufacturer to remain permanently elastic, non-shrinking, non-migrating and weatherproof.
i. Hardware:
a) Premachine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
b) Factory install door hardware.
j. Anchors:
a) Anchors appropriate for wall conditions to anchor framing to wall materials.
b) Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
c) Secure head and sill members of transom, side lites, and similar conditions.
k. Applied Door Stops:
a) 0.625-inch high, with screws and weatherstripping.
l. Pressure gasketing for weathering seal.
m. Counter punch fastener holes in door stop to preserve full-metal thickness under fastener head.

n. Caulking: Caulk joints before assembling frame members.
o. Joints:
a) Secure joints with fasteners.
b) Provide hairline butt joint appearance.
p. Open-back framing is not acceptable.

B. Aluminum Door Frames (Non-Rated)
1. Tubular Framing:
2. Perimeter Frame Members:
a. Box type with 4 enclosed sides.
b. Size: 2" x 6".
c. Factory fabricated.
d. Open-back framing is not acceptable.

C. Thermally Broken Aluminum Storefront Framing:
1. Model: SL-600TB, Special-Lite, Inc
2. Size and Type: As indicated on the Drawings.
3. Profiles: 5-3/4 inch (146 mm) deep, 2 inch (51 mm) wide at jambs, and 2 inch (51 mm) wide at headers.
4. Perimeter Frame Members:
a. Thermally broken pocket filler.
b. Factory fabricated by frame manufacturer.
c. Jambs, Mullions, Sills, Horizontal Intermediates, and Headers: 0.080-inch wall thickness.
d. Lock Jambs, Hinge Jambs, and Door Headers: 0.125-inch wall thickness.

D. Fire Rated Door Frames
1. Door Frames: Provide type in compliance with performance requirements specified for doors.
2. Type: Factory assembled with chemically welded joints.
3. Profiles: As indicated on drawings.
4. Provide frames bearing labels to match doors.
a. Fiberglass reinforced plastic (FRP) with gel-coating matching doors.
b. Framing:
a) Size and Type: As indicated on the Drawings.
b) Materials: ¼” thick solid pultruded FRP profiles having no corrosive components or reinforcement.
c) Width: 2” face.
d) Header: 2”
e) Depth: 5-3/4 and 6-3/4
f) Corner Construction: Mitered with 4” x 4” x 3/8” pultruded FRP angle reinforcement with interlocking pultruded FRP brackets.
g) Reinforcing: High density mineral.
h) Anchors: Furnished with type as recommended by the manufacturer.
i) Fasteners for reinforcing: 18-8 Stainless Steel.
5. Door Stop: 5/8 inch (15.9 mm) wide, by 2-7/8 inch (73 mm) deep.
6. Corner Joints: Mitered with concealed corner blocks or angles of same material as frame; fiberglass and aluminum joined with screws; steel and stainless steel spot welded; sealed watertight with silicone sealant.
7. Hardware Cut-outs: Provide continuous backing or mortar guards of same material as frame, with watertight seal.

8. Frame Anchors: Stainless steel, Type 304; provide three anchors in each jamb for heights up to 84 inches (2130 mm) with one additional anchor for each additional 24 inches (610 mm) in height.
9. Reinforcing: Provide manufacturer's standard reinforcing at hinge, strike, and closer locations.

2.3 MONUMENTAL WIDE STILE ALUMINUM DOORS

A. Model: SL-15 wide stile doors wide stile monumental aluminum stile and rail doors.

B. Door Opening Size: As indicated on the Drawings.

C. Door Thickness: 1-3/4 inches.

D. Stiles and Rails:
1. Material: Aluminum Alloy 6063-T5 tubular extrusions, 0.125-inch minimum wall thickness, 1-piece.
2. Stile Width: 4-3/4 inches.
3. Rails:
a. Top: 6-1/2 inches.
b. Bottom: 10 inches.
c. Screw or snap in place applied caps are not acceptable.
d. Meeting stiles to include integral pocket to accept pile brush weather seal.
e. Integral glass stops on exterior side, no snap or applied stops allowed.

E. Corners:
1. True mortise and tenon joints.
2. Full-width 3/8-inch diameter galvanized steel tie rods secured with locking hex nuts.
3. Weld, glue, or other methods of corner joinery are not acceptable.

F. Welding of Joints: Not permitted.

G. Mid Panel:
1. Model SL-484.
2. 12” high.
3. Core.
a. Poured-in-place polyurethane foam.
b. Laid in foam cores are not acceptable.
c. Foam Plastic Insulated Doors: IBC 2603.4.
a) Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
b) Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.
c) IBC 2603.4.1.7 foam plastic insulation, having a flame spread index less than 75 and a smoke developed index of not more than 450 shall be permitted as a door core when the face is metal minimum 0.032” aluminum or 0.016” steel.
d) Standard door assembly can be tested to show it meets these requirements without the use of thermal barrier. If no independent testing conducted all doors with foam plastic core must have a thermal barrier.
d. Frame.
a) Aluminum extrusions with extruded spline and interlocking edges to secure face sheet.
e. Secured to stiles with mortise & tenon joints and two 3/8” steel tie rods with locking hex nuts.

H. Fasteners:
1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.

2. Compatibility: Compatible with items to be fastened.
3. Exposed Fasteners: Oval Phillips head screws with finish matching items to be fastened.

I. Hardware.
1. Pre-machine doors in accordance with templates from specified hardware manufacturers.
2. Surface mounted closures will be reinforced for but not prepped or installed at factory.
3. Factory install door hardware.

J. Reinforcements.
1. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
2. Sheet and plate to conform to ASTM-B209.
3. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
4. Bars and tubes to meet ASTM-B221.

K. Performance.
1. Door and Thermally Broken Aluminum Frame Assembly.
a. Thermal Transmittance, NFRC 100.
a) Commercially Glazed Swinging Entrance Door (> than 50% glass)
(a) U-Factor = 0.62 Btu/hr?ft²?°F.
b. Air Leakage, NFRC 400, ASTM-E283.
a) Commercially Glazed Swinging Entrance Door (> than 50% glass)
(a) 0.39 cfm/sqft @ 1.57 psf.
(b) 0.78 cfm/sqft @ 6.24 psf.
c. Sound Transmission, ASTM-E90: STC = 30, OITC = 28

2.4 FIBERGLASS REINFORCED POLYESTER (FRP) DOORS:

A. Doors are to be constructed as follows:
1. Model S-17, 1 3/4" thick.
2. Constructed of aluminum alloy rails and stiles, joined with steel tie rods.
3. Stiles to be tubular shape to accept hardware as specified.
4. Top and bottom rails to be extruded with legs for interlocking "rigidity weather bar."
5. Joinery to be 3/8" tie rods, top and bottom, bolted through an extruded spline and 3/16" riveted reinforcing angles, and secured with aircraft type nuts. Doors with mid-panels are to have an additional tie rod at the mid-panel.

B. All doors shall be pre-machined in accordance with templates from the hardware manufacturer. For surface applied hardware doors shall have necessary reinforcement, including the attachment of RIVNUT blind bolt fasteners. With the exception of door closures and holders, which require field applications, doors are to be shipped with hardware attached.

C. Face sheets to be locked in with extruded interlocking edges. (No Snap-On trim will be accepted.)

D. Core is to be of Urethane foam of 5 lb. per cubic foot density. All doors are to be properly reinforced for hardware prior to Urethane core foaming in door.

E. Face sheets for FRP Doors are to be .120" thick..
1. Class A for all interior doors and interior face of exterior doors.

F. Cutouts:
1. Manufacture doors with cutouts for required vision lites and louvers.
2. Factory install vision lites and louvers.

G. Hardware:
1. Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule.

H. Fasteners:
   1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
   2. Compatibility: Compatible with items to be fastened

I. Color as selected by the Architect from Manufactures Standard or Classic Colors. Interior and exterior colors may be different.

2.5 INSULATED INFILL PANELS

A. Insulated Infill Panels: IP-1 Aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
   1. Thickness: 3" or as indicated.
   2. Exterior Skin: Porcelain on Aluminum 0.04 inch (1.0 mm) thick.
   3. Insulation Core: Isocyanurate 1.7-lb density Isocyanurate insulation core with R value of 18.56.
   4. Exterior Substrate: 3/16" hardboard.
   5. Interior Substrate: 1/2" Fire code gypsum
   6. Interior Skin: Aluminum 0.040 inch (1 mm) thick.
   7. Exterior Finish: Smooth custom Kynar high performance organic coating .
   8. Interior Finish: Smooth custom Kynar high performance organic coating.
   9. Warranty: 25 years.
   10. Product: "Mapestop" as manufactured by Mapes Architectural Panels; sales@mapes.com / www.mapespanels.com

2.6 FINISH HARDWARE:

A. Provide and factory install finish hardware for each door leaf as specified in Division 8 “Finish Hardware”.

B. SL-82 Class I Aluminum Recessed Pull Handles. Color selected by Architect.

C. Receive Hardware supplied in accordance with this Section, and coordinate with additional Hardware requirements of Section 08 7100. Report discrepancies (in writing) to the Architect immediately.

D. Reinforce, cut, drill and tap doors and frames as required to receive Hardware, except do not drill and tap for surface mounted closers and holders, which will be applied at the jobsite. Comply with Hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
   1. Reinforcement:
      a. Stile Edge: 1" High density mineral, FRP Edge Banding.
      b. Top Rail: 6” High density mineral.
      c. Bottom Rail: 2" High density mineral.

E. Install all Hardware, except surface mounted closers and holders, at the fabrication plant. Remove only Hardware as required for final finishing or delivery to jobsite. Package and identify such Hardware and ship with doors and frames for installation at the project site.

F. Painting: All existing surfaces to remain exposed, and all disturbed areas shall be painted to match existing surfaces.

G. Hinge and hardware fasteners Stainless steel Type 304

2.7 FABRICATION:

A. Sizes and Profiles: The required sizes for door and frame units, and profiles requirements are shown on the drawings.

B. The details shown are based upon standard details by one or more manufacturers. It is intended that similar details by other manufacturers will be accepted, provided they comply with size requirements, and with minimum/maximum profile requirements as shown.

C. Co-ordination of Fabrication: Check the actual frame or door openings in the construction work by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress, as directed by Contractor, and avoid delays of the work.

D. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to the cleaning, finishing, treatment and application for coatings. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64".

E. No Welding of joints will be accepted.

F. Conceal fasteners, wherever possible, except as otherwise noted.

G. Maintain continuity of line and accurate relation of planes and angles. Provide secure attachments and support at mechanical joints, with hairline fit at contacting members.

H. Reinforce the work as necessary for performance requirements, and for support to the structure. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion. Separate metal surfaces at moving joints with non-metallic separators to prevent "freeze-up" of joints.

2.8 FINISHES

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 50% polyvinylfluoride resin by weight; complying with AAMA 2604.
2. Color: As selected by Architect from manufacturer's Full Line including Metallics.

2.9 ACCESSORIES

A. Foam window and door seal.

1. Fill all exterior joint between windows and doors solid in accordance with manufacture's instructions.
2. Cut back to permit application of joint sealant.
3. Insulating-Foam Sealant: Dow Great Stuff Window & Door.

B. Snap Trim as required. Match door and frame finish.

C. Glazing: As specified in Section 08 8000.

D. Lite Kits:

1. Provide and factory install a Special-Lite FL-Series 2 piece extruded aluminum Class I Clear Anodized Lite Kit. Provide as per the drawings.
2. Size as indicated on drawings.
3. Factory Glazing: Refer to Section 08 8000 - Glazing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.

B. Do not begin installation until substrates have been properly prepared.

3.2 PREPARATION

A. Remove existing doors and frames, and dispose of all removed materials in accordance with local authorities having jurisdiction.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean and prepare substrate in accordance with manufacturer's directions.

D. Protect adjacent work and finish surfaces from damage during installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.

B. Install exterior doors in accordance with ASTM E2112.

C. Set units plumb, level, and true-to-line, without warping or racking doors or frames, and with specified clearances; anchor securely in place.

D. Set thresholds in continuous bed of sealant.

E. Install perimeter sealant in accordance with requirements specified in Section 07 9005.
   1. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.
   2. Cut back to permit application of joint sealant.

F. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

G. Repair or replace damaged installed products.

3.4 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.5 CLEANING

A. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance.

B. Do not use harsh cleaning materials or methods that would damage finish.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

C. Provide protective treatment and other precautions required through the remainder of the construction period, to ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Access door and frame units, fire-rated and non-fire-rated, in wall and ceiling locations.

1.3 RESPONIBILITY AND REQUIREMENTS

A. Each Contractor shall provided access doors for all dampers, valves, cleanest, junction boxes, pull boxes or similar items located above finished ceilings or ceiling breaks or extensions, behind finished walls or below finished floors. The access doors shall be steel, unless noted otherwise, hinged types as required for type of construction.
   1. Where feasible locate all dampers, valves, cleanest, junction boxes, pull boxes or similar items above acoustical panel tile ceilings.

B. In new walls, floor, ceiling, etc., access doors are to be installed by the General Construction Contractor and furnished by each Contractor whose work requires access.

C. Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.

1.4 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Openings in partitions.

B. Section 09 9123 - Interior Painting: Field paint finish.

C. Divisions 22, 23 and 26: Mechanical/ Electrical components requiring access.

1.5 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2016.

C. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

E. ITS (DIR) - Directory of Listed Products; current edition.

F. UL (FRD) - Fire Resistance Directory; Current Edition.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Samples: When requested, submit two access units, 12 x 12 inch (300 x 300 mm) in size illustrating frame configuration.

E. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

F. Project Record Documents: Record actual locations of each access unit.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

A. General:
   1. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
   2. Sizes shall be 12 X 12 inch at easily accessible valves and cleanouts; 18 X 18 inch where partial body access is required; 24 X 24 inch where entree body access is necessary.
   3. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.
   4. Where electric motors or heaters are installed above hung ceilings, provide disconnect switch in hung ceilings within reach from access doors, unless switch is located on wall immediately below.
      a. Disconnect switch shall be provided and installed by the Contractor furnishing the equipment unless shown otherwise.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   6. All access doors shall have integral casing bead, white enamel prime coat, reinforced panel, flush type tamper proof lock unless noted otherwise.
   7. All access doors in Toilets, Janitor Closets, Science and Prep Rooms, Storage Rooms, and Kitchen and Food Related Areas and similar spaces shall be watertight and constructed completely of stainless steel type 304.

B. Wall-Mounted Units in Wet Areas:
   1. Material: Stainless steel, Type 304.
   2. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   3. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.

C. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: Fire rating equivalent to the fire rated assembly in which they are to be installed..
   2. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.
   3. Panel Material: Steel.
   4. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units with Return Air Grille:
   1. Panel Material: Aluminum extrusion with gypsum board inlay.
   2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.

E. Fire-Rated Ceiling-Mounted Units:
   1. Ceiling Fire-Rating: As indicated on drawings.
   2. Panel Material: Steel.

2.2 MANUFACTURERS

A. Wall and Ceiling Access Doors:

1. Milcor by Commercial Products Group of Hart & Cooley, Inc: www.milcorinc.com.
2. Substitutions: Section 01 2500 Substitution Procedures .

2.3 Wall-MOUNTED ACCESS UNITS WITH RETURN AIR GRILLES

A. Gypsum Board Inlay Access Panels: Provide rectangular and square access panel with recessed and gasketed aluminum perimeter frame that acts as finishing edge and having concealed mechanical touch-latch with safety cable and free-pivoting hinge.

B. Air Return Grilles: Linear bar grille fitted with flush and concealed perimeter frame.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 4413
GLAZED ALUMINUM CURTAIN WALLS

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: Kawneer Architectural Aluminum Curtain Wall Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall units.
   1. Types of Kawneer Curtain Wall and Glazed Assemblies include:
      a. 1600UT System™1 Curtain Wall:
         a) 1" (25.4 mm) double glazed insulating glass: 2-1/2" x 6" and 2 1/2 x 7 1/2, pressure plate format.

1.3 Related Sections:

A. 079200 “Joint Sealants”

B. 085113 “Aluminum Windows”

C. 088000 “Glazing”

1.4 Definitions

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA) – AAMA Glossary (AAMA AG).

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Loosening or weakening of fasteners, attachments, and other components.
      d. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind loads: Provide Curtain Wall system; include anchorage, capable of withstanding wind load design pressures of 40 psf.

D. Structural-Test Performance: Test according to ASTM E 330 and TAS 202 as follows:
   1. When tested at positive and negative wind load design pressures, assemblies do not evidence deflection exceeding L/175 of clear span.
   2. A static air design load of 40 psf (1915 Pa) shall be applied in the positive and negative direction.
      a. When tested at 150% of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2% percent of clear span.
      b. Minimum test duration according to ASTM E 330 is 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite, or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less. Limit deflection of clear span of framing members to L/175 for spans less than or equal to 13'-6" (4.11 meters) and L/240 + ¼" for spans greater than 13'-6" (4.11 meters).
2. Deflection Parallel to Glazing Plane: Limited to [L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller] [amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm)].
    a. Operable Units: Provide a minimum 1/16-inch (1.6 mm) clearance between framing members and operable units.
3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.

F. Seismic: When tested to AAMA 501.4, system must meet design displacement (elastic) of 0.010 x the story height and ultimate displacement (inelastic) of 1.5 x the design displacement.

G. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 and TAS 202 at 15 psf (720 Pa).

H. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 15 psf (720 Pa).
1. Maximum Water Leakage: [According to AAMA 501.1] [No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation]. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

I. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
1. Temperature Change (Range): 0 deg F (-18 deg C); 180 deg F (82 deg C).
2. Test Interior Ambient-Air Temperature: [75 deg F (24 deg C)] .
3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5 for a minimum 3 cycles.

J. Energy Efficiency: Glazed aluminum curtain walls shall be tested in accordance with NFRC and AAMA Standards.

K. Thermal Transmittance (U-factor):
1. 1600UT System™1 Curtain Wall:
    a. Glass and framing areas shall have U-factor of no greater than 0.33 with 1" (25.4 mm) High Performance (HP) Glass as determined according to AAMA 1503 or Project specific ( ) BTU/Hr/Ft2/°F per AAMA 507 or ( ) BTU/Hr/Ft2/°F per NFRC 100.

L. Solar Heat Gain Coefficient: Glass and framing areas shall have a solar heat gain coefficient of no greater than [0.35] [0.40] [0.45] <Insert value> as determined according to NFRC 200.
1. Air Leakage: Maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq.ft. (0.31 l/s.m2) of fixed wall area as determined according to ASTM E 283 and TAS 202 at a minimum static-air-pressure differential of 6.2 psf (300 Pa).
2. Condensation Resistance: When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:
    a. 1600UT System™1 Curtain Wall:
        a) CRFglass (1" [25.4 mm] Double Glazed HP) = 76, CRFframe =79
3. Temperature Index (I): when tested to CSA-A440-00, the Temperature Index shall not be less than:
    a. 1600UT System™1 Curtain Wall with aluminum pressure plate:

a) Iglass (1" [25.4 mm] Double Glazed HP) = 67, Iframe =71
b) 1600UT System™1 Curtain Wall with fiber glass pressure plate:
(a) Iglass (1" [25.4 mm] Double Glazed HP) = 68, Iframe =76

M. Storm Shelter Performance:
1. Shall be tested to meet ICC500: ICC / NSSA Standard for the design and construction of storm shelters.
2. Missile Criteria for tornado shelters.
a. Design Wind Speed:
a) 200 mph (EF4)
b) Missile Speed:
(a) 90 mph (EF4)

N. Human Impact: Shall be tested to meet AAMA 501.8.

O. Sound Transmission: Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound-transmission characteristics:
1. 1600UT System™1 Curtain Wall:
a. STC-31 or OITC-25 when tested for laboratory sound transmission loss according to ASTM E 90 and ASTM E 1425, and based on 1" (25.4 mm) double insulating glass (1/4", 1/2" AS, 1/4")

P. Environmental Product Declaration (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.

Q. Material Ingredient Reporting: Shall have a complete list of chemical ingredients to at least 100ppm (0.01%) that covers 100% of the product, acceptable documentation includes:
1. Manufacturer's inventory with Chemical Abstract Service Registration Number (CASRN or CAS#).
a. Kawneer's Material Transparency Summary (MTS).
2. Cradle to Cradle certification: Either document below is acceptable for this option.
a. Cradle to Cradle CertifiedTM with Material Health section Silver or above.
b. Silver Level or above Material Health Certificate.
3. Red List Free DECLARE label.

1.6 Submittals

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work. Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 12 x 12 in size illustrating finished aluminum surface, glazing, and glazing materials.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" (304.8) lengths of full-size components and showing details of the following:
1. Joinery.
2. Glazing.

F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

G. Design Data: Provide stamped and sealed drawings, framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

H. Engineering Calculations: Submit calculations prepared and certified by a professional Engineer, registered and licensed for practice in the State of New York showing compliance with specifications, including type and location of all fasteners.
   1. Calculations shall include, but not limited to, the engineering analysis of a particular manufacturer of all individual and aggregate components, fastening devices, including fasteners for blocking, connections, and embeds of work of this section.
   2. Calculations shall be strictly coordinated with and referenced to details, and submitted concurrently with shop drawings

I. Structural Sealant Glazing (SSG): Submit product data and calculations showing compliance with performance requirements.

J. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements

K. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

L. Designer's Qualification Statement.

M. Manufacturer's Qualification Statement.

N. Installer's Qualification Statement.

O. Warranty: Submit manufacturer warranty and ensure forms have been completed in Brewster Central School District's name and registered with manufacturer.

P. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

Q. Samples for Initial Selection: For units with factory-applied color finishes.

R. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

S. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.

T. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:
   1. Joinery
   2. Glazing

1.7 Quality Assurance

A. Installer Qualifications: Installer who has had successful experience with installation of the same or similar systems required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed performance requirements.

C. Source Limitations: Obtain aluminum curtain wall system through one source from a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups for type(s) of curtain wall elevation(s) indicated, in location(s) shown on Drawings.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.8 Project Conditions

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 Warranty

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 Manufacturers

A. Basis-of-Design Product:
   1. Kawneer Company Inc.
   2. 1600UT System™1 Curtain Wall
   3. Frame depth : 6 inch with 1" (25.4 mm) Double Glazed Insulating Glass.
   4. Tested to AAMA 501-05 and TAS 202

B. Substitutions: Refer to Substitutions Section for procedures and submission requirements.
   1. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid curtain wall installation and construction delays.
   2. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
   3. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for curtain wall system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum curtain walls for a period of not less than ten (10) years. (Company Name).
   4. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
   5. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

C. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 Materials

A. Aluminum Extrusions: Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Aluminum sheet alloy: Shall meet the requirements of ASTM B209.

C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Pressure Plate: Pressure plate shall be either aluminum or fiberglass and fastened to the mullion with stainless steel screws. Fiberglass pressure plate shall be tested to ASTM D638, D790, D695, D953, D3846.

F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

G. Sealant: For sealants required within fabricated curtain wall system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

H. Thermal Barrier: Thermal barrier consists of 1" (25.4 mm) separation between the interior and exterior metal members in a typical condition. Thermal barrier assembly shall be tested to the thermal cycling requirements of ASTM E2692 and show no sign of degradation following the test.

I. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

J. Red List Free: All parts and materials comply with the Living Building Challenge/DECLARE Red List and the Cradle-to-Cradle (C2C) Banned List.
   1. PVC free.
   2. Neoprene free.

2.3 CURTAIN WALL FRAMING

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Glazing System: 4-sided captured or 2-sided SSG.
   2. Glazing Plane: Front.

B. Glass: 1" (25.4 mm) insulating glass option or 1" (25.4 mm) for Spandrel applications.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Framing Sealants: Shall be suitable for glazed aluminum curtain wall as recommended by sealant manufacturer.

E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.

F. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

G. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

H. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle curtain wall material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after installation.

2.4 GLAZING

A. Glazing: Comply with Division 08 Section “Glazing”. Following glazing options are available.
   1. 1600UT System™1 Curtain Wall: Outside glazed pressure plate format with 1" (25.4 mm) double glazed

B. Glazing Gaskets: Gaskets to meet the requirements of ASTM C864.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: As recommended by manufacturer for joint type.

2.5 OPERABLE UNITS

A. Doors: Comply with Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

B. Windows: Comply with Division 08 Section “Aluminum Windows”.

2.6 Accessory Materials

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762 mm) thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
7. Internal weeping system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
8. Double seal design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

C. Curtain Wall Framing: Fabricate components for assembly using shear block system following manufacturer's standard installation instructions.

D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 Aluminum Finishes

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:

1. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating (Color as selected by architect from manufacturers standard and premium colors.

PART 3 - EXECUTION

3.1 Examination

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

G. Install glazing as specified in Division 08 Section “Glazing.”

3.3 Field Quality Control

A. Field Tests: Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer’s representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
1. Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
a. Air Leakage Tests: Conduct tests in accordance with ASTM E 783. Allowable air leakage shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft2, whichever is greater.
b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).

B. Manufacturer’s Field Services: Upon Owner’s written request, provide periodic site visit by manufacturer’s field service representative.

3.4 Adjusting, Cleaning and Protection

A. Protection: Protect installed product’s finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance. Remove construction debris from project site and legally dispose of debris.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.5 DISCLAIMER STATEMENT

A. This guide specification is intended to be used by a qualified construction specifier. The guide specification is not intended to be verbatim as a project specification without appropriate modifications for the specific use intended. The guide specification must be used and coordinated with the procedures of each design firm, and the particular requirements of a specific construction project.

END OF SECTION

SECTION 08 5113
ALUMINUM WINDOWS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Exterior extruded aluminum windows with operating sash.

B. Factory glazing.

C. Project-Out and Casement Windows

D. Operating hardware.

E. Insect screens.

F. Foam sealant for filling perimeter window space.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry.

B. Section 06 1000 - Rough Carpentry: Wood perimeter shims and blocking.

C. Section 07 9200 - Joint Sealants: Sealing joints between window frames and adjacent construction.

D. Section 08 4413 - Glazed Aluminum Curtain Walls.

E. Section 08 8000 - Glazing.

1.4 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA) – AAMA Glossary (AAMA AG).

B. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

C. Minimum Test Size: Smallest size permitted for performance class (gateway test size) or as specified elsewhere in this section, whichever is more stringent. Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class. Downsized test reports will not be considered acceptable.

1.5 REFERENCE STANDARDS

A. AAMA 701/702 Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.

B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

F. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).

G. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

H. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2017.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.7 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed window system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Window Performance Requirements:

1. Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS). Performance Class and Grade;
    a. Project-Out Windows:
        a) 3-1/8" (79.4 mm); 3-7/8" (98.4 mm) Overall System Depth
        b) CW-PG40-AP (with 2-Cam Handles
    b. Outswing Casement Windows:
        a) 3-1/8" (79.4 mm); 3-7/8" (98.4 mm) Overall System Depth
        b) CW-PG40-C (with 2-Cam Handles
2. Air leakage: The test specimen shall be tested in accordance with ASTM E283. Air leakage rate shall not exceed 0.10 cfm/ft2 at a static air pressure differential of 6.2 psf (300 Pa). The test specimen shall meet the A3 rating of less than 0.55 (m3/h)/m at 1.6 psf (75 Pa) when tested in accordance with CAN/CSA-A440-00 Windows.
3. Water Resistance: The test specimen shall be tested in accordance with ASTM E547 and ASTM E331. There shall be no leakage as defined in the test method at a static air pressure differential of 12 psf (575 Pa). The test specimen shall meet the B7 rating with no water leakage at 12 psf (575 Pa) when tested in accordance with CAN/CSA-A440-00 Windows;
4. Uniform Load Deflection: A minimum static air pressure difference [choose from below] shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member. The test specimen shall meet the C3, C4 or C5 rating when tested in accordance with CAN/CSA-A440-00 Windows:
    a. Project-Out Windows:
        a) 3-1/8" (79.4 mm); 3-7/8" (98.4 mm) Overall System Depth
        b) CW-PG40-AP (with 2-Cam Handles); 40 psf (1915 Pa)
    b. Outswing Casement Windows:
        a) 3-1/8" (79.4 mm); 3-7/8" (98.4 mm) Overall System Depth
            (a) CW-PG40-C (with 2-Cam Handles); 40 psf (1915 Pa)
5. Uniform Load Structural: A minimum static air pressure difference of [choose from below] shall be applied in the positive and negative direction in accordance with ASTM E330. The unit shall be evaluated after each load with permanent set not to exceed 0.3% of span length.
    a. Project-Out Windows:
        a) 3-1/8" (79.4 mm); 3-7/8" (98.4 mm) Overall System Depth
            (a) CW-PG40-AP (with 2-Cam Handles); 60 psf (2873 Pa
    b. Outswing Casement Windows:
        a) 3-1/8" (79.4 mm); 3-7/8" (98.4 mm) Overall System Depth
            (a) CW-PG40-C (with 2-Cam Handles); 60 psf (2873 Pa)

6. Component Testing: Window components shall be tested in accordance with procedures described in AAMA/WDMA/CSA 101/I.S.2/A440 and AAMA 910.
7. Energy Efficiency:
    a. Thermal Transmittance (U-Factor): When tested to AAMA Specification 1503, AAMA Specification 507 or NFRC 100 the thermal transmittance (U-Factor) shall not be more than:
        a) 1" (25.4 mm) insulating glass:
            (a) Project-Out: U-Factor not more than .45 BTU/hr/ft2/°F per AAMA 1503 with exterior 3/16" (4.76 mm) clear glass, aluminum spacer, and interior 3/16" (4.76 mm) glass.
8. Condensation Resistance Test (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, the condensation resistance factor (CFR) shall not be less than:
    a. 1" (25.4 mm)clear insulating glass with aluminum spacer:
        a) Project-Out: CRF not less than 73 (frame) and 60 (glass.
9. Temperature Index (I): Provide aluminum windows tested for thermal performance according to CSA-A440 with a Temperature Index (I) not less than:
    a. 1" (25.4 mm) clear insulating glass with aluminum spacer:
        a) Project-Out: (I) not less than 68 (frame) and 61 (glass).
10. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested in accordance with AAMA Specification 1801, the STC and OITC shall not be less than:
    a. 1" (25.4 mm) insulating glass made with exterior 3/16" (4.76 mm) clear glass, 3/8" (9.52 mm) aluminum spacer, and interior 7/16" (11.11 mm) laminated clear glass:
        a) Project-Out: STC not less than 37; OITC not less than 30
11. Forced Entry Resistance: All windows shall conform to ASTM F588, Grade 10.
12. Blast Mitigation performance: Shall be tested or proven through analysis to meet ASTM F1642, GSA-TS01, and UFC 04-010.01 performance criteria.
    a. To meet UFC 04-010-01, B-3.1 Standard 10 for Windows and Skylights
13. Windborne-Debris-Impact-Resistance Performance: Shall be tested in accordance with ASTM E 1886 and information in ASTM E 1996 and TAS 201/203.
    a. Large – Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade (Outswing Casement only).

C. Environmental Product Declarations (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.

1.8 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

C. Performance Validation: Provide specified performance validation before submitting shop drawings or starting fabrication.

D. Shop Drawings: Indicate opening dimensions, elevations, sections, details, hardware, attachments to other work, operational clearances and installation details method for achieving air and vapor barrier seal to adjacent construction, ,framed opening tolerances, anchorage locations and installation requirements.

E. Samples:
1. Framing: Two samples, 12 by 12 inch (300 by 300 mm) in size illustrating typical corner construction, accessories, and finishes.

F. Product Details: Provide full size product details showing all frame and sash details, dimensions, thermal break construction, wall thicknesses, weather-stripping details and joinery. Details must accurately reflect all glazing and hardware options specified herein.

G. Engineering Calculations: Submit calculations prepared and certified by a professional Engineer, registered and licensed for practice in the State of New York showing compliance with specifications, including type and location of all fasteners.

1. Calculations shall include, but not limited to, the engineering analysis of a particular manufacturer of all individual and aggregate components, fastening devices, including fasteners for blocking, connections, and embeds of work of this section.
2. Calculations shall be strictly coordinated with and referenced to details, and submitted concurrently with shop drawings

H. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s), by prepared by a qualified testing agency for each window type being used on the project, not more than four years old, showing compliance with performance requirements in excess of those prescribed by specified grade. Test reports based on the use of downsized test units will not be accepted.

I. Certificates: Certify that windows meet or exceed specified requirements.

J. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

K. Maintenance Data: For operable window sash, operating hardware and finishes to include in maintenance manuals.

L. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

M. Manufacturer's Certification: Provide certification stating the manufacturer and series (model) number of the product conforms to the specifications.

N. Product Test Reports: Provide comprehensive test reports not more than four years old prepared by a qualified testing agency for each window type being used on the project. Test reports based on the use of downsized test units will not be accepted.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten (10) years of documented experience.

1. Aluminum windows shall meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five (5) years of documented experience and approved by manufacturer for installation of units required for this Project.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

1. **Manufacturer of Windows and Glazed Aluminum Curtain Wall shall be the same.**

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect , except with Architect 's written approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

1.10 MOCKUP:

A. Prior to installation install typical window for review and approval.

B. Locate as directed by the Construction Manager

C. Provide adjustments and recommend by Construction Manager .

D. Mockup may be used in the project.

E. Window manufacturer's technical representative and structural engineer shall inspect and provide a written report that window is installed in accordance withe the design criteria.

1.11 PRE-INSTALLATION MEETING

A. Convene one (1) week before starting work of this section at project site to review methods and procedures related to aluminum windows including, but not limited to, the following:.

B. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components.

C. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.

D. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.13 FIELD CONDITIONS

A. Field Measurements: For retrofit installations, verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

B. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

C. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.14 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection, water leakage, or air infiltration.
   c. Faulty operation of movable sash and hardware.
   d. Deterioration of metals or other materials beyond that which is normal.
   e. Failure of insulating glass.

C. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Brewster Central School District's name and register with manufacturer.

D. Manufacturer Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Brewster Central School District's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The basis of design for these specifications is as follows:

1. GLASSvent™ UT Windows (Structural Silicone Glazed)(Project-Out or Outswing Casement) Kawneer Company, Inc. 555 Guthridge Court Norcross, GA 30092, 770.449.5555.
   a. Project-Out Windows:
      a) 3-1/8" (79.4 mm); 3-7/8" (98.4 mm) Overall System Depth.
      b) CW-PG40-AP (with 2-Cam Handles).
2. Substitutions: See Section 01 2500 Substitution Procedures

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.080-inch thickness at any location for the main frame and sash members, except the frame sill which shall be a minimum of 0.125-inch
   1. Extruded Aluminum: ASTM B 221 (ASTM B 221M) 6063-T5 and temper (ASTM B221 G.S. 10A-T5).

B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.3 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals

B. Projected Windows:
   1. Hinge: Concealed four-bar friction hinge complying with AAMA 904 with adjustable-slide friction shoe; two per ventilator, stainless steel.
      a. 4-bar hinges.
      b. Lock: Cam-action, white bronze locking handle and keeper (2 if over 42" wide).
      c. Provide pole-operated automatic white bronze locks on inward acting ventilators, where the distance to the operating hardware exceeds five feet above the floor. 1 pole operator and pole hanger per room that has operable window hardware more than 60 inches above floor
      d. Limit Device: Integral adjustable stainless steel, stop (two per ventilator). Set the limit to 8”.

2.4 ACCESSORIES

A. Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
   1. Polypropylene sheet or polypropylene-coated material.
   2. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material.

B. Window and Door Joint Seal: Polyurethane-based joint filler:
   1. UL Classified.
   2. Product: "Great Stuff" as manufactured by Dow Chemical.
      a. "Gaps and Cracks: for joints less than 1".
      b. "Big Gap Filler" for joint over 1".
   3. Use for all filling all spaces and joints around windows and doors located on exterior walls.

C. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

D. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

E. Sealants and joint fillers for joints at perimeter of window system as specified in Division 7 Section “Joint Sealants”.

F. Insect Screens: 18 x 16 mesh, aluminum strands.0.011" coated aluminum wire
   1. Finish: Color as selected by the Architect.
   2. Provide seperate wicket screen for access to each operating handle.
      a. Use for all windows in cafeteria.

2.5 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fit joints; make joints flush, hairline and weatherproof.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   6. Provisions for field replacement of glazing.
   7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Window Vent and/or Vent Frame Joinery: Mitered and Mechanically clipped and/or staked. Factory sealed vent and /or vent frame and corner joints.

C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows

2.6 FINISHES

A. Match finish of Glazed Aluminum Curtain Wall.

B. Apply one coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify curtain wall framing are dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

3.2 REMOVALS

A. The following procedures shall be followed when existing window are removed:
   1. Work must be in compliance with OSHA Construction Standard (29 CFR 1926.62)..
   2. Windows directly below, above and adjacent to the work area shall be closed.
   3. Provide tarps on the outside of the building to catch all dust, debris and paint chips when windows are being removed and installed.
   4. Floor surfaces along the length of the window shall be provided one layer of six mil plastic.
   5. All air vents in the room shall be closed and/or shut off and sealed.
   6. Access to all rooms undergoing window replacement shall be restricted to prevent unauthorized entry.
   7. Owner to remove all objects, items, books, etc. from window wall casework and adjacent end walls. Owner to reinstall.

8. Contractor shall provide labor for daily cleanup on the interior and the exterior of the building as required or directed by the Construction Manager Any visible debris shall be removed prior to the on a daily basis. Only wet cleaning methods and/or HEPA vacuuming shall be used to clean.
9. All window components and debris disposed of properly in accordance with Federal, State and Local Regulations. Refer to Section 01 5000 - Temporary Facilities and Controls and asbestos and lead abatement sections for containers required.
10. Removal of existing windows and installation of new windows shall not be done until existing asbestos in windows and window frames is abated
11. Do not remove existing window sash, frame or components until new replacement windows are on site and ready for installation. Do not leave any openings unprotected at end of work day or during periods of excessive cold weather or precipitation.
12. At completion of the each work area HEPA vacuumed and wet wiped.
13. All corridors used by Contractors shall be mopped and left clean daily.

3.3 WINDOW INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows in accordance with manufacturer's instructions.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior

F. Install operating hardware not pre-installed by manufacturer.

G. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.
   1. Cut back to permit application of joint sealant.

H. Install perimeter sealant in accordance with requirements specified in Section 07 9200 - Joint Sealants.

3.4 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 10 ft (3 mm/3 m), whichever is less.

3.5 FIELD QUALITY CONTROL

A. Refer to Glass Curtain Wall Section.

3.6 ADJUSTING

A. Adjust operating sashes, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.7 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

B. Remove protective material from factory finished aluminum surfaces.

C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

D. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

E. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

F. Protection of newly installed windows and/or final cleaning of glass and aluminum to remove any accumulations that may have occurred during the construction period is to be the responsibility of the General Contractor.

G. Comply with manufacturer’s written recommendations for final cleaning and maintenance

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system

END OF SECTION

SECTION 08 5123
STEEL FIRE RATED WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Factory finished steel self closing windows with operating sash.

B. Operating hardware and framed insect screens.

1.2 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealing frames to water-resistive barrier installed on adjacent construction.

B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.3 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.

B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

F. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2010).

G. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

I. NFPA 101 - Life Safety Code; 2017.

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

K. SWI (INTRO) - Architect's Guide to Steel Windows and Doors; Current Edition.

L. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, fasteners, anchors, and glass.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; installation requirements.

D. Certificates: Certify that products of this section meet or exceed specified requirements.

E. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements.

F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Brewster Central School District's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing windows specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

B. Maintain this minimum temperature during and after installation of sealants.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.

1. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire-Rated Steel Windows:

1. Optimum Window;Optimum Window.com.
   a. FR7600 Series: Horizontal Sliding Window (45 min. rated)
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 STEEL WINDOWS

A. Steel Windows: Cold rolled steel sections, factory fabricated, factory finished, with vision glass, related flashings, anchorage and attachment devices.

2.3 PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand wind loads without damage or permanent set, when tested in accordance with ASTM E330/E330M, using pressure equal to 1.5 times specified design pressures, with 10 second duration of maximum load.

B. Design Pressure: In accordance with applicable codes.

C. Water Leakage: None, when measured in accordance with ASTM E331 with a test pressure difference of 2.86 lbf/sq ft (136.85 N/sq m).

D. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system to the exterior by a weep drainage network.

E. Fire-Rated Steel Windows: Comply with UL 9 and labeled with a 3/4 hour or 1 hour fire-test rating as indicated in window schedule, design and fabricate units to meet glass size and configuration, window size and opening dimensions in compliance with NFPA 80, and provide hardware complying with NFPA 80 requirements.

1. Provide operable fire-rated windows that are self-closing and latching by means of heat activated fusible link operator.

2.4 COMPONENTS

A. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.

B. Insect Screens: 14/18 mesh, steel strands.

C. Operable Sash Weather Stripping: Wool pile; permanently resilient, profiled to effect weather seal.

D. Sealant for Setting Sills, Stools, Aprons, and Sill Flashing: Non-curing butyl type.
   1. See Section 07 9200 for additional requirements.

2.5 MATERIALS

A. Fasteners: Steel, galvanized.

B. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20.

2.6 HARDWARE

A. Sash lock: Self latching lock.

2.7 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush and hairline.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners to conceal from view.

E. Prepare components with reinforcement for operating hardware.

F. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.

G. Double weatherstrip operable units.

H. Factory-glaze window units.

2.8 FINISHES

A. Window Frames: manufacturers epoxy primer and powder coat finish.

B. Screens: Black color.

C. Concealed Steel Items:
   1. Galvanized in accordance with requirements of ASTM A123/A123M.

D. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with treated wood, cementitious, or dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive steel windows; see Section 07 2500.

3.2 INSTALLATION

A. Install window frames and glass and glazing in accordance with manufacturers instructions.

B. Install fire-rated windows in accordance with NFPA 80 and NFPA 101.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Set sill members and sill flashing in continuous bead of sealant.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Install operating hardware.

H. Install glass in accordance with glazing method required to achieve performance criteria; see Section 08 8000.

3.3 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches in 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 10 ft (3 mm/3 m).

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed steel windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.

1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf (91 Pa).
2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf (300 Pa).

C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.5 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.6 CLEANING

A. Remove labels and visible markings.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

3.7 PROTECTION

A. Do not permit continuing construction activities near unprotected finish surfaces.

END OF SECTION

SECTION 08 6200
UNIT SKYLIGHTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Skylights with integral frame.

B. Operating mechanism.

C. Integral insulated curb.

1.3 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Miscellaneous steel framing for rough opening.

B. Section 06 1000 - Rough Carpentry: Wood support curbs.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Skylight counterflashing.

D. Section 07 7200 - Roof Accessories:

E. Section 07 9200 - Joint Sealants.

1.4 REFERENCE STANDARDS

A. American Architectural Manufacturer's Association (AAMA):

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of

C. Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

D. AAMA 605.2 - Voluntary Specification for High Performance Organic Coatings.

E. AAMA 607.1 - Voluntary Guide Specifications and Inspection Methods for Clear

F. Anodic Finishes for Architectural Aluminum.

G. AAMA 612 - Voluntary Specifications and Performance Requirements and Test

H. Procedures for Combined Coatings of Anodic Oxide and Transparent Coatings on

I. Architectural Aluminum, for Finishes such as Anodized Plus.

J. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

M. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass Kind HS, Kind FT Coated and Uncoated Glass.

N. Curtain Walls, and Doors by Uniform Static Air Pressure Difference

O. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

P. ASTM E773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.

Q. ASTM E774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units

R. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).

S. American Welding Society (AWS): AWS Structural Welding Code.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets including structural, thermal, and daylighting performance values.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Indicate materials, finishes and installation procedures recommended by manufacturer.
   4. Indicate compliance with specified design criteria.
   5. Indicate compliance with performance requirements.
   6. Include product specific glazing details

C. Performance Validation: Provide specified performance validation before submitting shop drawings or starting fabrication.

D. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation. details.
   1. Indicate material types, gauges and finishes, fabrication details and installation details.
   2. Show glazing types, methods of attachment and thermal movement provisions

E. Indicate compliance with specified structural design criteria.

F. Submitted design calculations shall bear seal of a professional engineer licensed in the State in which the skylight is to be installed.

G. Certify that engineer has reviewed shop drawings

H. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Test report(s) by independent testing agency itemizing compliance.

I. Samples: For each finish product specified, two complete sets of color chips presenting manufacturer's full range of available colors and patterns.

J. Manufacturer's Installation Instructions: Indicate special procedures.

K. Specimen warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than ten years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience and approved by manufacturer.

1.7 MOCKUP

A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

B. Finish areas designated by Construction Manager.

C. Do not proceed with remaining work until workmanship, color, and sheen are approved by Construction Manager.

D. Refinish mock-up area as required to produce acceptable work

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide five-year manufacturer warranty including coverage for leakage due to defective skylight materials or construction. Complete forms in Brewster Central School District's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Unit Skylights:
   1. American Skylights a division of the Andi Group; Ridge Lite Self Flashing (Model RLCM): www.americanskylights.com/#sle.
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 SKYLIGHTS

A. Skylights: Ridge Lite Skylight System, double glazed polycarbonate unit skylight system with thermally broken curb mount frame for installation on flashed curb. Factory-assembled glazing in aluminum frame, free of visual distortion, and weathertight.
   1. Shape: Model RLCM-FG.
   2. Glazing: Double. Polycarbonate
   3. Operation: None; fixed.
   4. Nominal Size: As indicated on drawings.

2.3 PERFORMANCE REQUIREMENTS

A. Provide unit skylights that comply with the following:
   1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific skylight type:
   2. Performance Validation: Skylights shall comply with AAMA/WDMA/CSA 101/I.S.2/A440 performance requirements as indicated by having AAMA, WDMA, or CSA certified label, or an independent test report for indicated products itemizing compliance and acceptable by authorities having jurisdiction.
   3. Design Pressure (DP):
      a. Positive Design Pressure: 40 psf (- Pa).
      b. Negative Design Pressure: 40 psf (- Pa).
   4. Allow for expansion and contraction within system components caused by a cycling surface temperature range of 170 degrees F (95 degrees C) without causing detrimental effects to system or components.

2.4 COMPONENTS

A. Double Glazing: Polycarbonate plastic; factory sealed.

B. Frames: ASTM B221 (ASTM B221M) Extruded aluminum thermally broken, reinforced and welded corner joints, integral curb frame mounting flange and counterflashing to receive roofing flashing system, with integral condensation collection gutter, glazing retainer; clear anodized finish.

2.5 FABRICATION

A. Rectangular and Square Curb Mount:

1. Thermally broken curb mount frame shall be fabricated from 6063-T5/T6 aluminum extrusion.
    a. Thickness shall be minimum .060 inch (1.5 mm) with a polyurethane thermal break to reduce thermal transfer and reduce condensation on the interior of the frame.
2. All corners shall be welded using the heliarc process.
3. Aluminum Finish:
    a. Dark bronze anodized.

B. Polycarbonate Domes:
1. Glazing shall be secured to frame with a fully welded retainer cap, minimum thickness of .125 inch (3.0 mm)
2. Polycarbonate domes shall be:
    a. Double Glazed Color: Clear/Clear.

C. Glazing Gaskets and Sealants: Glazing to be separated from frame by a continuous extruded black Santoprene gasket.

D. Fasteners: Screws and fasteners used in the factory assembly process shall be stainless steel. Fasteners and screws used for securing skylight to structure shall be suitable for substrate

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that openings and substrate conditions are ready to receive work of this section.

C. Verify that curbs installed under other sections are complete. notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions

3.3 INSTALLATION

A. Install unit skylights in accordance with manufacturer's instructions and ASTM E2112.

B. Install skylight units and mount securely to curb assembly; install counterflashing as required.

C. Apply sealant to achieve watertight assembly.

3.4 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces; wipe surfaces clean in accordance with manufacturers recommendations.
1. Cleaning instructions shall be located on manufacturer's label

C. Remove excess sealant.

END OF SECTION

SECTION 08 7101
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for hollow metal,FRP, aluminum and other doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

1.2 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealants for setting exterior door thresholds.

B. Section 081113 - Hollow Metal Doors and Frames.

C. Section 08 1613 - Fiberglass Doors and Frames

D. Section 101400 - Signage: Additional signage requirements.

E. Section 281000 - Access Control: Electronic access control devices.

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. BHMA A156.1 - Standard for Butts and Hinges 2021.

C. BHMA A156.2 - Bored and Preassembled Locks and Latches 2017.

D. BHMA A156.3 - Exit Devices 2020.

E. BHMA A156.7 - Template Hinge Dimensions 2016.

F. BHMA A156.18 - Materials and Finishes 2020.

G. BHMA A156.22 - Standard for Gasketing 2021.

H. BHMA A156.25 - Electrified Locking Devices 2018.

I. BHMA A156.26 - Standard for Continuous Hinges 2021.

J. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems 2018.

K. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.

L. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

N. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

P. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Q. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.

R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

T. UL 294 - Access Control System Units Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.
   5. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
   6. Keying Requirements Meeting:
      a. Schedule meeting at project site prior to Contractor occupancy.
      b. Attendance Required:
         a) Contractor.
         b) Owner.
         c) Architect.
         d) Installer's Architectural Hardware Consultant (AHC).
         e) Door Hardware Installer.
         f) Owner's Security Consultant.
      c. Agenda:
         a) Establish keying requirements.
         b) Verify locksets and locking hardware are functionally correct for project requirements.
         c) Verify that keying and programming complies with project requirements.
         d) Establish keying submittal schedule and update requirements.
      d. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
         a) Access control requirements.
         b) Key control system requirements.
         c) Schematic diagram of preliminary key system.
         d) Flow of traffic and extent of security required.
      e. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
      f. Deliver established keying requirements to manufacturers.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
   1. Prepared by or under supervision of Architectural Hardware Consultant.
   2. List groups and suffixes in proper sequence.
   3. Include complete description for each door listed.
   4. Include manufacturers and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
   5. Include account of abbreviations and symbols used in schedule.

6. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   a. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
   b. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   c. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.
7. Samples for Verification (If requested by Architect):
   a. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
   b. Submit one (1) sample of hinge, latchset, lockset, and closer illustrating style, color, and finish.
   c. Architect will return full-size samples to Contractor.
   d. Include product description with samples.
8. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
9. Manufacturer's qualification statement.
10. Installer's qualification statement.
11. Supplier's qualification statement.
12. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
    a. Include manufacturer's parts lists and templates.
    b. Bitting List: List of combinations as furnished.
13. Keying Schedule:
    a. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
14. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
15. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
16. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
    a. See Section 016000 - Product Requirements, for additional provisions.
    b. Lock Cylinders: Ten for each master keyed group.
    c. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.6 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) or similar to assist in work of this section.

E. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

1. Closers: Limited Lifetime.
2. Exit Devices: Five years, minimum.
3. Locksets and Cylinders: Five years, minimum.
4. Other Hardware: One year minimum.

PART 2 PRODUCTS

2.1 General Requirements

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Verification of existing conditions: Examine doors, frames, related items and conditions under which Work is to be performed such that specified hardware will accommodate these conditions.

C. Provide individual items of single type, of same model, and by same manufacturer unless otherwise specified.

D. Locks: Provide a lock for each door, unless it's indicated that lock is not required.

1. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's Series. As indicated in hardware sets.
    a. Provide an office lockset for swinging doors for which a lock function is not indicated.
    b. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.
    c. Strikes:
        a) Finish: To match lock or latch.
        b) Curved-Lip Strikes: Provide as standard, with extended lip to protect frame, unless otherwise indicated.
        c) Extra-Long-Lip Strikes: Provide for locks used on frames with applied wood casing trim.
        d) Aluminum-Frame Strike Box: Provide strike box fabricated for use with aluminum framing.
        e) Center Strike At Pairs of Doors: 7/8 inch (22.2 mm) lip.
2. Closers:
    a. Provide door closer on each exterior door, unless otherwise indicated.
    b. Provide door closer on each fire-rated and smoke-rated door.
    c. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
3. Thresholds:
    a. Interior Applications: Provide when specified at interior doors for transition between two different floor types, and over building expansion joints, unless otherwise indicated.
    b. Exterior Applications: Provide at each exterior door, unless otherwise indicated.
4. Smoke and Draft Control Seals:

a. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
b. Provide frame-applied intumescent gasketing on wood doors that are labeled as smoke and draft control doors (Indicated as "S" on Drawings), unless otherwise indicated.
c. See Section 08 1416 for wood door to frame sealing system applied by door manufacturer.

5. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
6. See Section 28 10 00 for additional access control system requirements.
7. Fasteners:
   a. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a) Aluminum fasteners are not permitted.
      b) Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   b. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
      a) Self-drilling (Tek) type screws are not permitted.
   c. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
   d. Provide wall grip inserts for hollow wall construction.
   e. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
   f. Fire-Resistance-Rated Applications: Comply with NFPA 80.
      a) Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
      b) Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.
   g. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated or required per manufacturer's testing requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
      a. ICC (IBC).
      b. NFPA 101.
      c. Accessibility: ADA Standards and ICC A117.1.
      d. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
      e. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or as suitable for application indicated.
      f. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
         a) Air Leakage Rate: Tested in accordance with UL 1784, with air leakage rate not to exceed 3.0 cfm/sf (0.01524 cu m/sec/sq m) of door opening at 0.10 inch (24.9 Pa) of water for both ambient and elevated temperature tests.

(a) When required for acceptance by authorities having jurisdiction for code-mandated applications, test without an artificial bottom seal.

g. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.

h. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.3 CONTINUOUS HINGES

A. Manufacturers:

1. BEST; dormakaba Group
2. Properties:
   a. Continuous Hinges: As applicable to each item specified.
      a) Geared Continuous Hinges: As applicable to each item specified.
         (a) Non-handed.
         (b) Anti-spinning through-fastener.
         (c) UL 10C listed for fire-resistance-rated doors.
            (1) Metal Door Installation: Rated up to 90 minutes.
            (2) Wood Door Installation: Rated up to 60 minutes.
            (3) Sufficient size to permit door to swing 180 degrees
3. Grades:
   a. Continuous Hinges: Comply with BHMA A156.26, Grade 1.
4. Material: Base metal as indicated for each item by BHMA material and finish designation.
5. Types:
   a. Continuous: Provide as specified.
6. Quantities:
   a. Continuous Hinges: One per door leaf.
7. Products:
   a. Continuous Hinges:
      a) Aluminum geared hinges.

2.4 EXIT DEVICES

A. Manufacturers:

1. BEST, dormakaba Group
2. Properties:
   a. Actuation: Touchbar
   b. Chassis:
      a) Construction: Investment heavy-duty cast steel, zinc dichromate plated.
      b) Compatibility: Standard Stile.
   c. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.
   d. Latch Bolts: Stainless steel deadlocking with 3/4 inch projection using latch bolt.
   e. Lever Design: Match project standard lockset trims.
   f. Cylinder: Include where cylinder dogging or locking trim is indicated.
   g. Strike as recommended by manufacturer for application indicated.
   h. Sound dampening on touch bar.
   i. Dogging:
      a) Non-Fire-Resistance-Rated Devices: Hex key dogging.
      b) Fire-Resistance-Rated Devices: Manual dogging not permitted.
   j. Touch bar assembly on wide style exit devices to have a 1/4 inch clearance to allow for vision frames.

k. Handing: Field-reversible.
l. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
    a) Provide through-bolts.
m. Weatherized finish 626W at exterior mounted locations.
n. Series and functions as specified.
o. Flush end caps

3. Options:
    a. Electrified Devices:
        a) Latchbolt Retraction: Continuous-duty solenoid latchbolt retraction.
    b. Delayed Egress Devices: Manufacturer's standard for the application.
    c. Battery operated alarm function. Provide WH495 unit for Remote Arming/Disarming, as indicated in Door Hardware Schedule.
    d. Remote powered alarm 12 VDC. Provide WH495 unit for Remote Arming/Disarming or External Activation.
    e. Internally mounted switch used to signal other components.
    f. Internally mounted switch that monitors the position of the latchbolt.
        a) Comply with weather-resistance performance specified for Weatherized devices.
    g. MLR: Motorized latch retraction.
    h. Exit Device Intruder Function Visual Indicator in conjunction with the ANSI “10” Function,
        a) Directional Indicator:
            (a) Actuation: By a rim cylinder equipped with a keyed core or thumb-turn.
            (b) Embossed into the active case cover.
        b) Large status window integrated into the housing of the exit device, with directional pointers to indicated key turn direction to lock and unlock outside lever trim.
        c) Use bright reflective materials capable of being seen in low light condition.
        d) Labels or stickers are not permitted.
        e) Impact resistant lens cover.
        f) A quarter turn (90 degrees) of key or thumb turn to lock down or unlock.
        g) Locked status indicated by a red indicator with an image of a locked padlock appearing under lens cover.
        h) Unlocked status indicated by a green indicator with an image of an unlocked padlock appearing under lens cover.
    i. Furnish less bottom rod (LBR) at scheduled locations to eliminate use of floor mounted strikes.
    j. Vandal-Resistant Trim: Heavy-duty lever trim with heavy-duty investment-cast stainless steel components and extra strength shock absorbing overload springs.
        a) Not requiring resetting.
        b) Lever design to match locksets and latchsets.
    k. Electrified Device Voltage: 24 VAC.
4. Grades: Complying with BHMA A156.3, Grade 1.
    a. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
5. Standards Compliance:
    a. UL Listed for Panic and Fire for Class II Circuitry.
    b. Provide UL (DIR) listed exit device assemblies for fire-resistance-rated doors.
    c. Comply with UL 10C.

6. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
7. Products:
   a. 2000.

2.5 Removable Mullions

A. Manufacturers:
   1. BEST, dormakaba Group
   2. Properties:
      a. Rectangular shape 3 inches (76 mm) by 2 inches (51 mm) tubes with minimum 1/8 inch (3.2 mm) wall thickness.
      b. Furnished by the same manufacturer as exit devices.
      c. Pre-drilled holes for installation of exit device strikes.
      d. Spacers: Provide as required for proper installation, based on frame profile and dimensions.
   3. Grades: Complying with BHMA A156.3.
   4. Materials: Manufacturer's standard for items specified.
      a. Top and Bottom Brackets: Investment-cast steel.
   5. Options:
      a. Furnish Keyed Removable “KR” feature and corresponding cylinders as specified.
         a) Mullions capable of being installed without physical key present.
         b) Physical key required to operate.
      b. Furnish electrified mullion as specified.
   6. Applications: As indicated on drawings and in Door Hardware Schedule.
      a. Fire-Resistance-Rated Openings: Mullions with UL Listed Labels and mullion stabilizers.
   7. Products:
      a. 822 Series.

2.6 LOCK CYLINDERS

A. Manufacturers:
   1. BEST, dormakaba Group
   2. Substitutions: See Section 01 2500.
   3. Properties:
      a. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
         a) Provide cylinders from same manufacturer as locking device.
         b) Provide cams and/or tailpieces as required for locking devices.
         c) Provide cylinders with appropriate format conventional cores where indicated.
   4. Grades:
      a. Standard Security Cylinders: Comply with BHMA A156.5.
   5. Material:
      a. Manufacturer's standard corrosion-resistant brass alloy.
   6. Types: Refer to existing standards.
   7. Applications: At locations indicated in hardware sets, and as follows
      a. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
         a) When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.

2.7 CYLINDRICAL LOCKS

A. Manufacturers:
1. BEST, dormakaba Group
2. Substitutions: See Section 01 2500.
3. Properties:
a. UL listed for use on single or pairs of doors with fire-resistance-rating up to 3 hours and latchbolt throw of 1/2 inch (12.7 mm).
b. Mechanical Locks:
a) Fitting modified ANSI A115.2 door preparation.
b) Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
c) Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
(a) Through-bolted anti-rotational studs.
(b) Lock chassis constructed of steel, stainless steel and zinc components for superior strength and corrosion resistance.
d) Cast stainless steel latch retractor with roller bearings for exceptionally smooth operation and superior strength and durability.
e) Bored Hole: 2-1/8 inch (54 mm) diameter.
f) Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
g) Latch: Single piece tail-piece construction.
(a) Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
h) Cylinders:
(a) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
(1) Small format interchangeable.
i) Lever Trim:
(a) Style: See Door Hardware Schedule.
(b) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
(c) Strength: Locksets outside locked lever designed to withstand minimum1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
(d) Independent spring mechanism for each lever.
(1) Contain lever springs in the main lock hub.
(2) Outside Lever Sleeve: Seamless one-piece construction.
(3) Keyed Levers: Removable only after core is removed by authorized control key.
(4) Abrasive Lever Handles: Include a special abrasive strip on back of the hand grasp portion of lever.
(5) Tactile Lever Handles: Machine grooves into the back of the hand grasp portion of the lever.
(6) Series and functions as specified.
c. Electrified Locks: Same properties as standard locks, and as follows:
a) Voltage: 24 VAC.
b) Function: Electrically locked (Fail Safe) or unlocked (Fail Secure), as indicated for each lock in Door Hardware Schedule.
c) Temperature Control Module (TCM).

d) Internal request-to-exit feature.

4. Finishes: See Door Hardware Schedule.
   a. Core Faces: Match finish of lockset.
5. Grades: Comply with BHMA A156.2, Grade 1, Series 4000, Operational Grade 1, Extra Heavy Duty.
   a. Durability: Passing 50 Million cycle tests verified by third party testing agency.
6. Material: Manufacturer's standard for specified lock.
   a. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.
   b. Outside Lever Sleeve: Hardened steel alloy.
7. Options:
   a. Regulatory Compliance: As required by authorities having jurisdiction the State in which the Project is located.
8. Products: Cylindrical locks, including mechanical and electrified types.
   a. 9K (Grade 1).

2.8 CLOSERS

A. Manufacturers:
   1. dormakaba, dormakaba Group
   2. Properties:
      a. Surface Mounted Closers: Manufacturer's standard.
         a) Maximum Projection from Face of Door: 2-7/16 inches
         b) Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.
         c) Pinion: Stainless steel.
         d) Hydraulic Fluid: All-weather type.
         e) Arm Assembly: Standard for product specified.
            (a) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
            (b) Parallel arm to be a heavy-duty rigid arm.
         f) Covers:
            (a) Type: Standard for product selected.
               (1) Full.
               (2) Material: Metal
               (3) Finish: Painted.
   3. Grades:
      a. Closers: Comply with BHMA A156.4, Grade 1.
         a) Underwriters Laboratories Compliance:
            (a) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
               (1) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
               (2) CAN/ULC S-133 - Standard Method Of Tests For Door Closers Intended For Use With Swinging Doors.
         b) Testing Standards Compliance: Meeting requirements of UL 10C for positive pressure.
   4. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
   5. Products:
      a. Surface Mounted:

a) 8900

2.9 Keys and Cores

A. Manufacturers:
1. BEST, dormakaba Group
2. Substitutions: See Section 01 2500
3. Properties: Complying with guidelines of BHMA A156.28.
   a. Provide small format interchangeable core into existing system.
   b. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
   c. Keying: Existing Master key system.
   d. Include construction keying and control keying with removable core cylinders.
   e. Do not make brass construction cores and construction control and operating keys a part of Owner's permanent keying system, nor furnish in the same keyway (or key section) as Owner, permanent keying system.
   f. Key to existing keying system.
   g. For estimate, supply keys in following quantities:
      a) Great Grand Master Keys: 1 each.
      b) Grand Master Keys: 1 each.
      c) Master Keys: 4 each.
      d) Construction Master Keys: 6 each.
      e) Construction Keys: 15 each.
      f) Construction Control Keys: 2 each.
      g) Control Keys if New System: 2 each.
      h) Extra Cylinder Cores: 2 each.
      i) Change Keys: 2 each for each keyed core.
   h. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
   i. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
   j. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
   k. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.
4. Products:
   a. Existing Best System.

2.10 OVERHEAD STOPS AND HOLDERS

A. Manufacturers:
1. dormakaba; dormakaba Group
2. Architectural Builders Hardware Mfg
3. Properties:
   a. Stop Settings: Degrees opening as required
4. Sizes: Manufacturer’s standard for the application.
5. Grades: As applicable to item specified.
   a. Comply with BHMA A156.8, Grade 1.
6. Types:
   a. Concealed.

7. Products:
   a. Concealed Overhead Stops and Holders:
      a) ABH: 1020 Series

2.11 FINISHES

A. Finishes: Identified in Hardware Sets.

B. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Finish: 630; satin stainless steel, with stainless steel 3000 series base material (former US equivalent 32D), 652; satin chromium plated over nickel, with steel base material (former US equivalent 26D), and 689; aluminum painted, with any base material (former US equivalent US28); BHMA A156.18.
   2. Exceptions:
      a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
      b. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.
      c. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.
      d. Aluminum Surface Trim and Gasket Housings: Anodized to match door panel finish, not other hardware, unless otherwise indicated.
      e. Hardware for Aluminum Storefront Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Match existing height as required.

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

L. Hardware Installer shall coordinate with Security contractor to route cable to connect electrified locks, panic hardware, and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

M. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacture's technical documentation

3.3 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.4 HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. The hardware sets represent the product design intent and direction of the owner and architect. They should not be considered a detailed hardware schedule. Detailed or omitted items not included in the following hardware set(s) should be scheduled and submitted with the appropriate additional hardware required for proper application and functionality.

C. Manufacturer's Abbreviations:

1. BEST
2. Precision
3. RCI
4. Dormakaba
5. National Guard Products
6. ABH Manufacturing
7. Trimco

3.5 HARDWARE SETS

Set #001

Doors: 100, 108, 155, 201

2- Continuous Hinge		662HD SO EPT		AL	BE
1- Removable Mullion		KR822 MCS 689		PR	
2- Exit Device	ELR LS TS 2103 CA-03 SNB (2)			630	PR
3- Rim Cylinder	12E-72 L/C	626	BE		
3- SFIC	Owner Standard		626	BE	
2- Flush Pull	Owner Standard		630	TR	
2- Closer	8916 SPA SN689		DM		
2- Custom 5th Hole Spacer		4040XP-201-ST1944		689	LC
2- Floor Stop (optional)		1214CK X 1268CK		626	TR
2- Base Stop	1475	626	DJ		
1- Mullion Seal	5100 S		NA		
1- Perimeter Seal	700S @ Head		NA		
2- Perimeter Seal	700ES @ Jambs			NA	
2- Door Sweep	D698A		NA		
1- Threshold	Per Detail	AL	NA		
2- Position Switch		9540	BLK	RC	
2- Power Transfer		EPT-12C	630	PR	

1- Power Supply	ELR152		PR	
1- Card Reader	By Security Provider			
1- Junction Box	By Electrical			
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades			

NOTE: Card reader to retract latches for authorized access.

NOTE: Coordinate additional requirements with security and electrical drawings.

NOTE: Provide base or wall stop where adequate wall conditions occur.

NOTE: Provide and coordinate placement of floor stop where wall stop will not mount.

Set #002 - NOT USED

Set #003

Doors: 109

2- Continuous Hinge		662HD SO EPT		AL	BE
2- Exit Device	ELR LS TS 2103 CA-03 SNB (2)			630	PR
3- Rim Cylinder	12E-72 L/C	626	BE		
3- SFIC	Owner Standard		626	BE	
2- Flush Pull	Owner Standard		630	TR	
2- Closer	8916 SPA SN689		DM		
2- Custom 5th Hole Spacer		4040XP-201-ST1944		689	LC
2- Base Stop	1475	626	DJ		
1- Mullion Seal	5100 S		NA		
1- Perimeter Seal	700S @ Head		NA		
2- Perimeter Seal	700ES @ Jambs			NA	
2- Door Sweep	D698A		NA		
1- Threshold	Per Detail	AL	NA		
2- Position Switch		9540	BLK	RC	
1- Power Transfer		EPT-12C	630	PR	
1- Power Supply	ELR152		PR		
1- Card Reader	By Security Provider				
1- Junction Box	By Electrical				
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Card reader to retract latches for authorized access.

NOTE: Coordinate additional requirements with security and electrical drawings.

Set #004

Doors: 121, 122

1- Continuous Hinge		662HD SO	AL	BE
1- Exit Device	2103 CA-03 SNB		630	PR
1- SFIC	Owner Standard		626	BE
1- Rim Cylinder	12E-72 L/C	626	BE	
1- Flush Pull	Owner Standard		630	TR

1- Closer	8916 S-DS SN		689	DM	
1- Custom 5th Hole Spacer	4040XP-201-ST		1944	689	LC
1- Perimeter Seal	700S @ Head		NA		
2- Perimeter Seal	700ES @ Jambs			NA	
1- Door Sweep	D698A		NA		
1- Threshold	Per Detail	AL	NA		
1- Position Switch		9540	BLK	RC	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Coordinate additional requirements with security and electrical drawings.

Set #005

Doors: 127, 130

2- Continuous Hinge	662HD SO	AL	BE	
1- Removable Mullion	KR822 MCS	689	PR	
1- Weatherized Exit Device	2101 SNB (6)	626W	PR	
1-Weatherized Exit Device	2114 X 4914A SNB (2)		626W	PR
1- Rim Cylinder	12E-72 L/C	626	BE	
1- SFIC	Owner Standard	626	BE	
2- Closer	8916 S-DS NFHD SN	689	DM	
2- Custom 5th Hole Spacer	4040XP-201-ST	1944	689	LC
1- Mullion Seal	5100 S	NA		
1- Perimeter Seal	700S @ Head	NA		
2- Perimeter Seal	700ES @ Jambs		NA	
1- Gasketing	5025C @ Head & Jambs		NA	
2- Door Shoe	35ET6	NA		
1- Threshold	Per Detail	AL	NA	
2- Position Switch		9540	BLK	RC
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades			

NOTE: Coordinate additional requirements with security and electrical drawings.

Set #006

Doors: 128, 129

2- Continuous Hinge	662HD SO	AL	BE	
1- Removable Mullion	KR822 MCS	689	PR	
1- Exit Device	2101 SNB (6)	630	PR	
1- Exit Device	2110VI X 4908A SNB (2)	630	PR	
3- Rim Cylinder	12E-72 L/C	626	BE	
3- SFIC	Owner Standard	626	BE	
2- Closer	8916 SPA SN	689	DM	
2- Custom 5th Hole Spacer	4040XP-201-ST	1944	689	LC
2- Base Stop	1475	626	DJ	

1- Mullion Seal	5100 S		NA		
1- Perimeter Seal	700S @ Head		NA		
2- Perimeter Seal	700ES @ Jambs			NA	
1- Gasketing	5025C @ Head & Jambs			NA	
2- Door Shoe	35ET6		NA		
1- Threshold	Per Detail	AL	NA		
2- Position Switch		9540	BLK	RC	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Coordinate additional requirements with security and electrical drawings.

Set #007

Doors: 135

2- Continuous Hinge		662HD SO	AL	BE	
1- Removable Mullion		KR822 MCS	689	PR	
1- Weatherized Exit Device		2101 SNB (6)	626W	PR	
1- Weatherized Exit Device		2110VI X 4908A SNB (2)	626W		PR
1- Rim Cylinder	12E-72 L/C	626	BE		
1- SFIC	Owner Standard		626	BE	
2- Closer	8916 S-DS NFHD SN		689	DM	
2- Custom 5th Hole Spacer		4040XP-201-ST1944	689		LC
1- Mullion Seal	5100 S		NA		
1- Perimeter Seal	700S @ Head		NA		
2- Perimeter Seal	700ES @ Jambs			NA	
1- Gasketing	5025C @ Head & Jambs			NA	
2- Door Shoe	35ET6		NA		
1- Threshold	Per Detail	AL	NA		
2- Position Switch		9540	BLK	RC	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Coordinate additional requirements with security and electrical drawings.

Set #100

Doors: 101

6- Hinge	FBB168 4.5" x 4.5" NRP		26D	BE	
1- Removable Mullion		FLKR822 MCS	689		PR
1- Exit Device	FL 2101 SNB (6)		630	PR	
2- Exit Device	FL 2110VI X 4908A SNB (2)		630		PR
3- Rim Cylinder	12E-72 L/C	626	BE		
3- SFIC	Owner Standard		626	BE	
2- Closer	8916 SPA SN	689	DM		
2- Kick Plate	KO050 10" x 2" LDW x CSK B4E		630		TR
2- Overhead Stop		N1020 Series	US32D	AB	

1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		

Set #101

Doors: 102, 103

3- Hinge	FBB168 4.5" x 4.5" NRP		26D	BE	
1- Classroom Lockset	9K3-7R15D L/C S3B		626	BE	
1- SFIC	Owner Standard		626	BE	
1- Closer	8916 SPA SN689		DM		
1- Kick Plate	KO050 10" x 2" LDW x CSK B4E		630	TR	
1- Mop Plate	KM050 6" x 1" LDW x CSK B4E		630	TR	
1- Wall Bumper	1270CVSV	626	TR		
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		

Set #102

Doors: 104, 105

3- Hinge	FBB179 4.5" x 4.5" NRP		26D	BE	
1- Office Lockset	9K3-7AB15D L/C S3B		626	BE	
1- SFIC	Owner Standard		626	BE	
1- Closer	8916 AF89 REG SN		689	DM	
1- Wall Bumper	1270CVSV	626	TR		
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		

Set #103

Doors: 106, 126, 131, 202

6- Hinge	FBB168 4.5" x 4.5" NRP		26D	BE	
1- Removable Mullion	FLKR822 MCS			689	PR
1- Exit Device	FL 2101 SNB (6)		630	PR	
1- Exit Device	FL 2110VI X 4908A SNB (2)		630	PR	
3- Rim Cylinder	12E-72 L/C	626	BE		
4- SFIC	Owner Standard		626	BE	
2- Closer	8916 DS SN	689	DM		
2- High-Hold Magnetic Holder	2500 Series x EXT			SP28	AB
2- Kick Plate	KO050 10" x 2" LDW x CSK B4E		630	TR	
1- Mullion Seal	5100 S		NA		
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		
1- Key Switch	KS801 L1	628	DM		
1- Mortise Cylinder	1E-74 L/C		626	BE	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Integrate magnetic holders into fire alarm.

NOTE: Coordinate dead stop with magnetic holders.

NOTE: Key switch to enable or disable magnetic holders as required.

Set #104

Doors: 107

2-	Continuous Hinge	662HD SO	AL	BE	
1-	Removable Mullion	KR822 MCS	689	PR	
2-	Exit Device	2103 CA-03 SNB	630	PR	
3-	Rim Cylinder	12E-72 L/C	626	BE	
3-	SFIC	Owner Standard	626	BE	
2-	Flush Pull	Owner Standard	630	TR	
2-	Closer	8916 SPA SN689	DM		
1-	Custom 5th Hole Spacer	4040XP-201-ST1944	689	LC	
2-	Wall Bumper	1270CVSV	626	TR	
1-	Mullion Seal	5100 S	NA		
1-	Gasketing	5025C @ Head & Jambs		NA	
1-	Threshold	Per Detail	AL	NA	

Set #105

Doors: 110, 111

3-	Hinge	FBB179 4.5" x 4.5" NRP	26D	BE	
1-	Storeroom Lockset	9K3-7D15D L/C S3B	626	BE	
1-	SFIC	Owner Standard	626	BE	
1-	Kick Plate	KO050 10" x 2" LDW x CSK B4E	630	TR	
1-	Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR	
1-	Wall Bumper	1270CVSV	626	TR	
1-	Gasketing	5025C @ Head & Jambs		NA	
1-	Threshold	Per Detail	AL	NA	

Set #106

Doors: 112

3-	Hinge	FBB179 4.5" x 4.5" NRP	26D	BE	
1-	Passage Set	9K3-0N15D S3B	626	BE	
1-	Kick Plate	KO050 10" x 2" LDW x CSK B4E	630	TR	
1-	Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR	
1-	Wall Bumper	1270CVSV	626	TR	
3-	Silencer	1229A	BLK	TR	

Set #107

Doors: 113

3-	Hinge	FBB179 4.5" x 4.5" NRP	26D	BE	
1-	Privacy Set	9K3-0L15D S3B	626	BE	

1- Kick Plate	KO050 10" x 2" LDW x CSK B4E			630	TR
1- Mop Plate	KM050 6" x 1" LDW x CSK B4E			630	TR
1- Wall Bumper	1270CVSV	626	TR		
1- Silencer	1229A	BLK	TR		
1- Stone Threshold		Per Detail (as required)		AL	NA

Set #108

Doors: 114

3- Hinge	FBB179 4.5" x 4.5" NRP		26D	BE	
1- Storeroom Lockset		9K3-7D15D L/C S3B		626	BE
1- SFIC	Owner Standard		626	BE	
1- Kick Plate	KO050 10" x 2" LDW x CSK B4E			630	TR
1- Mop Plate	KM050 6" x 1" LDW x CSK B4E			630	TR
1- Wall Bumper	1270CVSV	626	TR		
3- Silencer	1229A	BLK	TR		

Set #109

Doors: 115

3- Hinge	FBB179 4.5" x 4.5" NRP		26D	BE	
1- Office Lockset	9K3-7AB15D L/C S3B		626	BE	
1- SFIC	Owner Standard		626	BE	
1- Kick Plate	KO050 10" x 2" LDW x CSK B4E			630	TR
1- Wall Bumper	1270CVSV	626	TR		
3- Silencer	1229A	BLK	TR		

Set #110

Doors: 116

3- Hinge	FBB179 4.5" x 4.5" NRP		26D	BE	
1- Storeroom Lockset		9K3-7D15D L/C S3B		626	BE
1- SFIC	Owner Standard		626	BE	
1- Closer	8916 AF89 REG SN		689	DM	
1- Kick Plate	KO050 10" x 2" LDW x CSK B4E			630	TR
1- Wall Bumper	1270CVSV	626	TR		
1- Gasketing	5025C @ Head & Jambs			NA	

Set #111

Doors: 117, 118, 119, 120

3- Hinge	FBB179 4.5" x 4.5" NRP		26D	BE	
1- Storeroom Lockset		9K3-7D15D L/C S3B		626	BE
1- SFIC	Owner Standard		626	BE	
1- Closer	8916 SPA SN689		DM		
1- Electromagnetic Door Holder			2100 Series x EXT	US32D	AB
1- Kick Plate	KO050 10" x 2" LDW x CSK B4E			630	TR

1- Mop Plate	KM050 6" x 1" LDW x CSK B4E		630	TR
1- Gasketing	5025C @ Head & Jambs		NA	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades			

NOTE: Integrate magnetic holders into fire alarm.

NOTE: Coordinate mounting of magnet housing with wall conditions.

Set #112

Doors: 123, 124

3- Hinge	FBB179 4.5" x 4.5" NRP	26D	BE	
1- Classroom Intruder Lock	9K3-7IN15D L/C S3B		626	BE
2- SFIC	Owner Standard	626	BE	
1- Closer	8916 S-DS SN	689	DM	
1- Gasketing	5025C @ Head & Jambs		NA	
1- Threshold	Per Detail	AL	NA	

Set #113

Doors: 125

6- Hinge	FBB168 4.5" x 4.5" NRP	26D	BE	
1- Exit Device	FL 2801 LBR SNB (6)	630	PR	
1- Exit Device	FL 2814 X 4914A LBR SNB (2)		630	PR
2- Closer	8916 DS SN	689	DM	
2- High-Hold Magnetic Holder	2500 Series x EXT		SP28	AB
1- Meeting Stile Astragal Set	9605A		NA	
1- Gasketing	5025C @ Head & Jambs		NA	
1- Threshold	Per Detail	AL	NA	
1- Key Switch	KS801 L1	628	DM	
1- Mortise Cylinder	1E-74 L/C	626	BE	
1- SFIC	Owner Standard	626	BE	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades			

NOTE: Integrate magnetic holders into fire alarm.

NOTE: Coordinate dead stop with magnetic holders.

NOTE: Key switch to enable or disable magnetic holders as required.

Set #114

Doors: 132, 151

6- Hinge	FBB179 4.5" x 4.5" NRP	26D	BE	
1- Coordinator	3094 Series x FB	Silver	TR	
1- Automatic Flush Bolt	3810 X 3810	626	TR	
1- Dust Proof Strike	3910 or 3910N (as required)		630	TR
1- Storeroom Lockset	9K3-7D15D L/C 3/4 S3B TL/O		626	BE
1- SFIC	Owner Standard	626	BE	
2- Closer	8916 AF89 REG SN	689	DM	

2- Kick Plate	KO050 10" x 1" LDW x CSK B4E			630	TR
1- Wall Bumper	1270CVSV	626	TR		
1- Astragal	139SSTB (Push side in-act leaf)			US32D	NA
1- Meeting Stile Seal	5070			NA	
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		

Set #115

Doors: 133

6- Hinge	FBB168 4.5" x 4.5" NRP		26D	BE	
1- Removable Mullion	FLKR822 MCS			689	PR
1- Exit Device	FL 2101 SNB (6)		630	PR	
1- Exit Device	FL 2110VI X 4908A SNB (2)			630	PR
3- Rim Cylinder	12E-72 L/C	626	BE		
4- SFIC	Owner Standard		626	BE	
2- Closer	8916 SPA SN689		DM		
2- High-Hold Magnetic Holder	2500 Series x EXT			SP28	AB
2- Floor Stop	1214	626	TR		
2- Kick Plate	KO050 10" x 2" LDW x CSK B4E			630	TR
1- Mullion Seal	5100 S		NA		
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		
1- Key Switch	KS801 L1	628	DM		
1- Mortise Cylinder	1E-74 L/C	626	BE		
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Integrate magnetic holders into fire alarm.

NOTE: Coordinate dead stop with magnetic holders.

NOTE: Key switch to enable or disable magnetic holders as required.

Set #116

Doors: 134

3- Hinge	FBB179 4.5" x 4.5" NRP		26D	BE	
1- Storeroom Lockset	9K3-7D15D L/C S3B			626	BE
1- SFIC	Owner Standard		626	BE	
1- Closer	8916 AF89 REG SN		689	DM	
1- Kick Plate	KO050 10" x 2" LDW x CSK B4E			630	TR
1- Mop Plate	KM050 6" x 1" LDW x CSK B4E			630	TR
1- Wall Bumper	1270CVSV	626	TR		
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		

NOTE: Omit closer if non-rated door.

Set #117

Doors: 200

6- Hinge	FBB168 4.5" x 4.5" NRP		26D	BE	
1- Exit Device	FL 2801 LBR SNB (6)		630	PR	
1- Exit Device	FL 2814 X 4914A LBR SNB (2)		630	PR	
2- Closer	8916 SPA SN689		DM		
2- High-Hold Magnetic Holder	2500 Series x EXT		SP28	AB	
1- Meeting Stile Astragal Set	9605A		NA		
1- Gasketing	5025C @ Head & Jambs		NA		
1- Threshold	Per Detail	AL	NA		
1- Key Switch	KS801 L1	628	DM		
1- Mortise Cylinder		1E-74 L/C	626	BE	
1- SFIC	Owner Standard		626	BE	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Integrate magnetic holders into fire alarm.

NOTE: Key switch to enable or disable magnetic holders as required.

Set #118

Doors: 203

3- Hinge	FBB179 4.5" x 4.5" NRP	26D	BE	
1- Office Lockset	9K3-7AB15D L/C S3B	626	BE	
1- SFIC	Owner Standard	626	BE	
1- Closer	8916 AF89 REG SN	689	DM	
1- Wall Bumper	1270CVSV 626	TR		
1- Gasketing	5025C @ Head & Jambs		NA	
1- Threshold	Per Detail AL	NA		

Set #119

Doors: 153, 204, 223

3- Hinge	FBB179 4.5" x 4.5" NRP	26D	BE	
1- Storeroom Lockset	9K3-7D15D L/C S3B	626	BE	
1- SFIC	Owner Standard	626	BE	
1- Wall Bumper	1270CVSV 626	TR		
3- Silencer	1229A BLK	TR		

Set #120

Doors: 152, 220, 221, 222, 224

3- Hinge	FBB168 4.5" x 4.5" NRP	26D	BE	
1- Classroom Intruder Lock	9K3-7IN15D L/C S3B	626	BE	
2- SFIC	Owner Standard	626	BE	
1- Closer	8916 AF89 REG SN	689	DM	
1- Kick Plate	KO050 10" x 2" LDW x CSK B4E	630	TR	

1- Wall Bumper	1270CVSV	626	TR		
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		

Set #121

Doors: 225

3- Hinge	FBB168 4.5" x 4.5" NRP		26D	BE	
1- Classroom Intruder Lock	9K3-7IN15D L/C S3B		626	BE	
3- SFIC	Owner Standard		626	BE	
1- High-Hold Magnetic Holder	2500 Series x EXT		SP28	AB	
1- Closer	8916 SPA SN689		DM		
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		
1- Key Switch	KS801 L1	628	DM		
1- Mortise Cylinder		1E-74 L/C	626	BE	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Integrate magnetic holders into fire alarm.

NOTE: Key switch to enable or disable magnetic holders as required.

Set #122

Doors: 150, 154

6- Hinge	FBB168 4.5" x 4.5" NRP		26D	BE	
2- Exit Device	FL 2801 LBR SNB (6)		630	PR	
2- Closer	8916 SPA SN689		DM		
2- High-Hold Magnetic Holder	2500 Series x EXT		SP28	AB	
1- Astragal	By Door Mfg.				
1- Gasketing	5025C @ Head & Jambs			NA	
1- Threshold	Per Detail	AL	NA		
1- Key Switch	KS801 L1	628	DM		
1- Mortise Cylinder		1E-74 L/C	626	BE	
1- SFIC	Owner Standard		626	BE	
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades				

NOTE: Integrate magnetic holders into fire alarm.

NOTE: Key switch to enable or disable magnetic holders as required.

Set #123

Doors: 210

3- Hinge	FBB168 4.5" x 4.5" NRP		26D	BE	
1- Passage Set	9K3-0N15D S3B		626	BE	
1- SFIC	Owner Standard		626	BE	
1-Closer	8916 SPA SN689		DM		
1- High-Hold Magnetic Holder	2500 Series x EXT		SP28	AB	

1- Gasketing	5025C @ Head & Jambs			NA
1- Threshold	Per Detail	AL	NA	
1- Key Switch	KS801 L1	628	DM	
1- Mortise Cylinder		1E-74 L/C	626	BE
1- Wiring & Riser Diagrams	Coordinate w/ Related Trades			

NOTE: Integrate magnetic holders into fire alarm.

NOTE: Key switch to enable or disable magnetic holders as required.

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Insulating glass

B. Glazing units.

C. Laminated safety glass.

D. Fire rated safety glass.

E. Insulated laminated glass

F. Glazing compounds and accessories

1.3 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites installed in doors and borrowed lites.

C. Section 08 1613 - Fiberglass Doors and Aluminum Frames: Glazed lites installed in doors and borrowed lites.

D. Section 08 4413 - Glazed Aluminum Curtain Walls. Glazing installed in curtain wall assembly.

E. Section 08 5113 - Aluminum Windows in Curtain Walls

F. Section 08 5123 - Steel Fire Rated Windows: Glazing furnished and installed by window manufacturer.

1.4 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. Sealed Insulating Glass Unit Surface Designations:

1. Surface 1 - Exterior surface of the outer glass lite.
2. Surface 2 - Interspace surface of the outer glass lite.
3. Surface 3 - Interspace surface of the inner glass lite.
4. Surface 4 - Interior surface of the inner glass lite.

D. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.5 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

D. ASTM C1036 - Standard Specification for Flat Glass; 2016.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

H. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

J. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2017.

K. ASTM E 2188 – Standard Test Method for Insulating Glass Unit Performance and Evaluation.

L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

M. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

N. GANA (SM) - GANA Sealant Manual; 2008.

O. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

P. ICC (IBC) - International Building Code; 2018.

Q. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

R. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

S. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

T. New York State Section 2406 Safety Glazing.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data for each glass product and glazing material indicated. Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch (300 by 300 mm) in size of glass units.

E. Samples: Submit 6 inch (150 mm) long bead of glazing sealant, color as selected.

F. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

G. Certificate: Certify in writing and signed by manufacturers that products of this section meet or exceed specified requirements.

H. 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.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Brewster Central School District's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Sustainable Design Certification: Glass shall be Cradle to Cradle Certified™, minimum Silver Level, Cradle to Cradle Innovation Institute.

B. Perform Work in accordance with GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Manufacturers Alliance

D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, Insulating Glass Manufacturers Alliance ANSI Z97.1.
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
   2. Lites more than 9 square feet (sf) (0.84 sq. m) in area are required to be Category II materials

E. Where glazing units, including Kind FT glass, are specified in Part 2 articles for glazing lites more than 9 sf in area, provide glazing products that comply with Category II materials, and for lites 9 sf or less in area, provide glazing products that comply with Category I or II materials.

F. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum Ten (10) years of documented experience and meet ANSI / ASQC Q9002 1994.

G. Fabricator Qualifications: Manufactured Certified as acceptable to the manufacturer

H. Installer Qualifications: Company specializing in performing work of the type specified and with at least five (5) years documented experience and approved by manufacturer.
   1. Manufacture shall provide field inspection of the installation.
   2. An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

I. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type:
   1. Insulating glass.

J. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.

K. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
   1. Insulating Glass products are to by permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
      a. Insulating Glass Certification Council (IGCC).
      b. Single Source fabrication responsibility: All fabrication processes, including Low E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single Fabricator.

L. Insulating Glass products are to by permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
   1. Insulating Glass Certification Council (IGCC).
   2. Single Source fabrication responsibility: All fabrication processes, including Low E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single Fabricator.

M. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.8 MOCK-UPS

A. See Section 01 4000 - Quality Requirements and individual sections for additional mock-up requirements.

B. Provide on-site glazing mock-up with the specified glazing components.

C. Locate where directed.

D. Mock-ups may remain as part of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating glass units that will be exposed to substantial altitude changes, comply with insulating glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including replacement of failed units.

D. Fire rated glazing: 5 year manufacturers standard coverage warranty.

E. Coated-Glass Products: Manufacturer's standard form, made out to the glass fabricator, in which the coated glass manufacturer agrees to replace coated glass units that deteriorate during normal use within the specified warranty period. Deterioration of the coated glass is defined as peeling and/or cracking, or discoloration that is not attributed to glass breakage, seal failure, improper installation or cleaning and maintenance that is contrary to the manufacturer's written instructions.

1. Warranty Period:five (5) from date of Substantial Completion

F. Polycarbonate Sheet Glazing: Provide a five (5) year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Glass Fabricators:

1. Basis of Design For Insulated Glass: Vitro Architectural Glass, Vitro Glass Technology Center, 400 Guys Run Rd., Cheswick, PA 15024. ASD. Toll Free Tel: (800) 377-5267. Fax: (800) 367-2986. Web: <http://www.vitroglazings.com.
2. For Security and Specialty Glazing refer to individual glazing types.
3. Substitutions: Refer to Section 01 2500 - Substitution Procedures

B. Laminated Glass Manufacturers:

1. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com.
2. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
3. Substitutions: Refer to Section 01 2500 - Substitution Procedures

C. Fire Rated Safety Glass conforming to Underwriters Laboratories, Inc. Fire Tests of Door Assemblies and the following:

1. Firelite Plus, clear ceramic laminated with 2 pieces of Premium Lite and a proprietary interlayer specialty high impact fire rated glazing material.
   a. Thickness: 5/16"
   b. Provide Safety film as specified in Section 08 9717.
   c. U Value: 0.40
   d. Weight: 3.8-lbs/sq. ft.
   e. Sound Transmission Rating: 38 STC
   f. Glazing materials shall be optically clear, colorless and free from usual distortion.

g. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory fire rating period and safety glazing standards.
h. Glazing material installed shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80 and:
i. ANSI Z97.1
j. CPSC 16 CFR 1201, Category II 400 ft.lbs.
k. Glazing shall be installed in a rated framing system meeting ASTM E2010-01, NFPA 257, UL 9, UBC 7-4 or CAN4-S106 and ASTM E2074-00, NFPA 252, UL 10b, UBC 7-2 or CAN4-S104

2. Use for all interior vision panels in fire rated doors, transoms in fire rated door assemblies, and glass within 18" above the floor.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Design Pressure:
a. Positive Design Pressure: 40 psf.
b. Negative Design Pressure: 40 psf.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Specified Design Snow Loads: As indicated on Drawings, but not less than snow loads applicable to Project as required by ASCE 7, Minimum Design Loads for Buildings and Other Structures: Section 7.0, Snow Loads
4. Probability of Breakage for Vertical Glazing: 0% lites per 1000 for lites set vertically or not more than 15 degrees off vertical
a. Wind Load Duration: Short duration, as defined in ASTM E 1300 .
5. Probability of Breakage for Vertical Glazing: 0% lites per 1000 for lites set vertically or not more than 15 degrees off vertical
a. Wind Load Duration: Short duration, as defined in ASTM E 1300
6. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
7. Glass thicknesses listed are minimum.

B. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Refer to window and glazed aluminum curtain wall specification sections for overall thermal transmittance requirements.

2.3 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
a. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
b. For uncoated glass, comply with requirements for Condition A.

c. For coated vision glass, comply with requirements for Condition C (other uncoated glass).

3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

B. Fire-Resistance-Rated Glass Manufacturers: Provide products as required to achieve indicated fire-rating period.

1. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.
2. Substitutions: Refer to Section 01 2500 - Substitution Procedures..

C. Laminated Glass Manufacturers: Float glass laminated in accordance with ASTM C1172.

1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.4 INSULATING GLASS UNITS GENERAL

A. Manufacturers:

1. Vitro Architectural Glass (formerly PPG Glass); Solarban 60: www.vitroglazings.com/#sle.

B. Insulating Glass Units: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Edge Seal:
   a. Single-Sealed System: Provide silicone, polysulfide, or polyurethane sealant as seal applied around perimeter.
4. Color: Black.
5. Purge interpane space with dry air, hermetically sealed with argon gas.

C. Space between lites filled with gas as required to maintain Thermal Transmittance Overall U-value.

D. Total Thickness: 1 inch (25.4 mm).

E. Solar Heat Gain Coefficient (SHGC): 0.38, nominal.

F. Spacer Color: Black.

G. Edge Seal:

1. Single-Sealed System: Provide silicone, polysulfide, or polyurethane sealant as seal applied around perimeter.
2. Color: Black.
3. Purge interpane space with dry air, hermetically sealed with Argon gas.

2.5 GLASS TYPES

A. **Insulated Glazing**

1. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 60 on #2 surface.
2. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick.
   a. Glass: Clear.
3. Total Thickness: 1".
4. FIll with Argon gas.
5. Use for all window, storefront, and curtain wall applications.
6. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

B. **Insulated Security Glazing:**

1. Outboard Lite: School Guard Glass SG4 IGU float glass, 1/4 inch (6.4 mm) thick, minimum.

a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 60 on #2 surface.
b. Tint: Clear.

2. Inboard Lite: School Guard Glass SG4 IGU, 1/4 inch (6.4 mm) thick.
   a. Tint: Clear.
   b. Size : As shown on drawing.
   c. Thickness: 1/4".
   d. Ratings: UL 972; 5-aa1 rated for 6 minutes.
   e. BR Level 2 low spall.
   f. UL 972
   g. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch (0.762 mm) thick, minimum.
3. Total Thickness: 1".
4. FIll with Argon gas.
5. Use for all exterior doors and as indicated on drawings.
6. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

C. **Insulated Laminated Glazing:**

1. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 60 on #2 surface.
   b. Tint: Clear.
2. Inboard Lite: Laminated Safety Glass, 1/4 inch (6.4 mm) thick.
   a. Tint: Clear.
3. Total Thickness: 1"
4. Fill with Argon gas.
5. For all exterior door lites.
6. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

D. **Insulated Spandrel Glazing:**

1. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 60 on #2 surface.
   b. Tint: Clear.
2. Inboard Lite: Laminated Safety Glass, 1/4 inch (6.4 mm) thick.
   a. Tint: Clear.
   b. Sandblast #3 surface.
   c. Opacifer Ceramic frit on #4 surface. Color as selected by the Architect.
3. Total Thickness: 1"
4. Use for where indicated on drawings.
5. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

E. **Monolithic Interior Non-Rated Vision Glazing:**

1. Applications: As scheduled.
2. Glass Type: Laminated float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch (6.4 mm), nominal. (For all Doors not within Aluminum Framing.)
5. Thickness: 3/8 inch nominal. (For all Doors and sidelights within Aluminum Framing.)
6. Interlayer: Polyvinyl butural (PVB) Thickness as required to meet performance requirements.
7. Use for all non-rated interior door sidelights and all interior glass within 18" above the finished floor.

8. Refer to Section 01 2500 - Substitution Procedures

F. **Fire Rated Safety Interior Vision Glazing**

1. Conform to Underwriters Laboratories, Inc. Fire Tests of Door Assemblies and the following:
2. Firelite Plus, clear ceramic laminated with 2 pieces of PREMIUM FireLite and a proprietary interlayer specialty high impact fire rated glazing material.
   a. Thickness: 5/16”
   b. U Value: 0.40
   c. Weight: 3.8-lbs/sq. ft.
   d. Sound Transmission Rating: 38 STC
   e. Glazing materials shall be optically clear, colorless and free from usual distortion.
   f. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory fire rating period and safety glazing standards.
   g. Glazing material installed shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80 and:
   h. ANSI Z97.1
   i. CPSC 16 CFR 1201, Category II 400 ft.lbs.
   j. Glazing shall be installed in a rated framing system meeting ASTM E2010-01, NFPA 257, UL 9, UBC 7-4 or CAN4-S106 and ASTM E2074-00, NFPA 252, UL 10b, UBC 7-2 or CAN4-S104
3. Use for all interior vision panels in fire rated doors, sidelites adjacent to fire rate doors, glass within 18" above the floor., and glass in fire rated partitions and corridor doors.
4. Refer to Section 01 2500 - Substitution Procedures

2.6 GLAZING COMPOUNDS

A. As reccommended by the manufacturer.

2.7 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

1. Width: As required for application.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements

2.9 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements and individual sections requirements.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.4 GLAZING SYSTEM:

A. Manufacturer's standard factory-glazing system that produces weather tight seal.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.6 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.7 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.8 SCHEDULE

A. Refer to drawings schedule and drawings for location and/or requirements.

END OF SECTION

SECTION 08 8004
METAL WINDOW PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. The Panels required are as manufactured by Mapes Architectural Panels, LLC, Lincoln, NE. Panels consist of metal skins laminated to stabilizer substrates with an insulating core material. Panels are designed to be glazed into a window system or curtain wall system

1.3 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants.

B. Section 08 4413 - Glazed Aluminum Curtain Walls.

C. Section 08 1113 - Hollow Metal Doors

1.4 REFERENCE STANDARDS

A. American Society of Testing Materials (ASTM)

B. E330-84: Structural Performance of Exterior Windows, Curtain Walls and Doors under the influence of wind loads.

C. D1781-76: Climbing Drum Peel Test for Adhesives.

D. D3363-74: Method for Film Hardness by Pencil Test.

E. D2794-90: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

F. D3359-90: Method for Measuring Adhesion by the tape test

1.5 SUBMITTALS

A. See Section 01 3000 for submittal procedures.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes .

1. Two copies of manufacturers standard literature for specified material.

C. Shop Drawings: Indicate thickness, dimension and components of parts. Detail glazing methods, framing and tolerances to accommodate thermal movement.

D. Samples: Two panels, 10 by 10 inches (- by - mm) in size, showing color and finish.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 25 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

C. Maximum deviation from vertical and horizontal alignment of installed panels is 1/8" (3mm) in 20' (6m) non-commutative

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect finish and edge in accordance with panel manufacturer's recommendations.

B. Store materials in accordance with panel manufacturer's recommendations.

1.8 WARRANTY

A. Manufacturer Warranty: Provide 10 year manufacturer warranty for finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Laminated metal faced MapeStop Panels as manufactured by Mapes Industries, Inc.

B. Substitutions: See Section 01 2500 Substitution Procedures.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper

B. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

C. Infill Panels: [IP-1] Insulated, aluminum [sheet face and back], with edges formed to fit glazing channel and sealed.

1. Thickness: 1".
2. Exterior Sheet: 0.063 inch (- mm) thick.
3. Interior Sheet: 0.063 inch (- mm) thick.
4. Exterior and Interior Substrate: 3/16" High density tempered hardboard inch (4.69 mm) thick.
5. Exterior Finish: Aluminum match curtain wall. Kynar.
6. Interior Finish: Mill finish.
7. Seals against moisture intrusion as recommended by the manufacturer. Polyurethane and silicone based sealant with a 20 year life are recommended.
8. Tolerances - .8% of panels dimension length and width - (+/-) 1/16" thickness
9. R-Value - 4.68
10. U-Value - 0.21
11. Warranty: 25 years.
12. Product: Laminated metal faced "Mapes-R" as manufactured by Mapes Industries. sales@mapes.com / www.mapespanels.com

D. Infill Panels: IP-2 Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.

1. Thickness: 2".
2. Exterior Sheet:.063 inch (1.56 mm) thick.
3. Interior Sheet: 0.063 inch (1.56 mm) thick.
4. Core: Polystyrene insulation.
5. Exterior Substrate: 3/16" High density tempered hardboard inch (4.69 mm) thick.
6. Interior Substrate: 5/8” Gypsum Board.
7. Tolerances: .8% of panels dimension length and width - (+/-) 1/16" thickness
8. R-Value - 7.78
9. U-Value - 0.13
10. Exterior Finish: Aluminum match curtain wall. Kynar
11. Interior Finish: Clear anodized.
12. Warranty: 25 years.
13. Product: "Mapestop" as manufactured by Mapes Architectural Panels; sales@mapes.com / www.mapespanels.com

2.3 Operable Sash: Refer to See Section 08 5113 - Aluminum Windows .

2.4 ACCESSORIES

A. Seals against moisture intrusion as recommended by the manufacturer. Polyurethane and silicone based sealant with a 20 year life are recommended.

PART 3 EXECUTION

3.1 EXAMINATION

A. Panel surfaces shall be free from defects prior to installation.

3.2 INSTALLATION

A. Erect panels plumb, level and true.

B. Glaze panels securely and in accordance with approved shop drawings and manufacturers instructions to allow for necessary thermal movement and structural support.

C. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.

D. Weatherseal all joints as required using methods and materials as previously specified.

E. Separate dissimilar metals using gasketed fasteners and blocking to eliminate the possibility of electrolytic reaction.

F. Install in accordance with manufacturer's written instructions.

3.3 INTERFACE WITH OTHER WORK

A. Refer to Section 08 4413 - Glazed Aluminum Curtain Walls for installation of panels.

3.4 CLEANING

A. Remove masking film as soon as possible after installation. Masking intentionally left in place after panel installation will be the responsibility of the contractor.

B. Weep holes and drainage channels must be unobstructed and free from dirt and sealant

3.5 PROTECTION

A. Protect installed panels from subsequent construction operations.

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Wall mounted louvers, frames, and accessories.

B. Rooftop mounted Louver Screens, structural framing, steel sub-framing and related components.

C. Foam sealant for filling perimeter of louver space..

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry

B. Section 05 1200 - Structural Steel Framing

C. Section 07 2500 - Weather Barriers: Sealing frames to water-resistive barrier installed on adjacent construction.

D. Section 07 5419 - PVC roofing

E. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

F. Section 09 9113 - Exterior Painting: Field painting.

1.4 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 612 - Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2017a.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches (50 by 50 mm) in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum five (5) years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

D. Welding: Qualify procedures and personnel according AWS D1.2, "Structural Welding Code--Aluminum."

E. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.

1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Louvers:

1. Airolite Company, LLC; _____: www.airolite.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 LOUVERS

A. Rooftop Louver Screens: (See drawings for locations.)

1. Product: Airolite Louver Screen; Type SCB601
2. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.
3. Horizontal louver blade, extruded aluminum.
   a. 4" depth
   b. V-shaped, sightproof
   c. Finish: High performance organic coating.
4. Structural steel subrame and anchorage to roof top by others. Steel subframe as indicated on drawings. Galvanized.
5. Connect to engineered steel frame structure as indicated on drawings. Engineered by Airolite.
6. Miter all corners of louvers and frames.

2.3 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T-5 temper.

2.4 FINISHES

A. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

B. Color: As selected from manufacturer's standard colors and premium colors.

2.5 ACCESSORIES

A. Window and Door Joint Seal: Polyurethane-based joint filler:

1. UL Classified.
2. Product: "Great Stuff" as manufactured by Dow Chemical.
   a. "Gaps and Cracks: for joints less than 1".

b. "Big Gap Filler" for joint over 1".

3. Use for all filling all spaces and joints around louvers located on exterior walls.

B. Sealant: Type, as specified in Section 07 9200 - Joint Sealants.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.2 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.

3.3 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

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 SECTION INCLUDES

A. Metal channel soffit/ceiling framing.

B. Metal Trim

C. Gypsum sheathing.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

C. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.4 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2017a.

H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.

J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

K. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

O. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

P. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

1.6 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.

B. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.1 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

B. Manufacturers - Metal Framing, Connectors, and Accessories:
1. Marino: www.marinoware.com.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

D. Suspended Ceiling and Soffit Framing:
1. Components, General: Comply with ASTM C 754 for conditions indicated.
2. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.
3. Hangers:
   a. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
   b. Rod Hangers: ASTM A 510, mild carbon steel.
      a) Diameter: 1/4-inch.
      b) Protective Coating: ASTM A 153/A 153M, hot-dip galvanized.
4. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch-wide flange, with ASTM A 653, G40 (Z120), hot-dip galvanized zinc coating.
   a. Depth: 1-1/2” unless otherwise indicated.
5. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.
   a. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch-wide flange, 3/4 inch deep.
   b. Steel Studs: ASTM C 645.
      a) Minimum Base Metal Thickness: As indicated.
      b) Depth: As indicated.
6. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a) Armstrong World Industries, Inc.; Furring Systems/Drywall.
   b. Main Beam: Shall be double-web construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (per ASTM A653).

a) HD8901: 1-1/2 inch web height, prefinished 15/16 inch flange with minimum G40 hot dipped galvanization.

c. Primary Cross Tees: Shall be double-web steel construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (minimum G40 or G90 per ASTM A653), web height 1-1/2 inch with rectangular bulb and prefinished 1-1/2" knurled flange.

d. Secondary Framing Cross Tees : Shall be double web steel construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (minimum G40, web height 1-1/2 inch rectangular bulb and 15/16 inch flange (XL8341)

e. Hat Furring Channel, HD8940: Shall be 48 inch x 1-3/8 inch x 7/8 inch, hot dipped galvanized steel (minimum G40 per ASTM A653); compatible with HD8901 and HD8906 main beams.

f. Wall Molding:

a) HD7859: Hot dipped galvanized (minimum G40), hemmed angle molding, 1-1/4 inch height with 1-1/4 inch flange.

g. Clips:

a) MBAC - Main Beam Adapter Clip

b) DWACS, DW50, DW58 - Drywall Attachment Clip for transitions to acoustical ceilings

c) XTAC - Cross Tee Adapter Clip

h. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.

7. Structural Classification:

a. Main Beam shall be heavy duty per ASTM C 635.

b. Classification can require wires to be closer together for additional loading when used to support double layer gypsum, verticals, slopes, domes, half barrels, circles, soffits, canopies, and step conditions which call for loading or unusual designs and shapes in drywall construction. Using cross tees in the construction of circles, barrels, etc. is common in order to hold the radius.

c. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span

2.2 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. Georgia-Pacific Gypsum: www.gpgypsum.com.
2. National Gypsum Company: www.nationalgypsum.com.
3. USG Corporation: www.usg.com.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, Type X, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   a. Mold resistant board is required at all locations.
3. Thickness:
   a. Vertical Surfaces: 5/8 inch (16 mm).
   b. Ceilings: 1/2 inch (13 mm).
4. Mold Resistant Paper Faced Products:
   a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
   b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.

C. Abuse Resistant Wallboard:

1. Application: Where indicated on the drawings..
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass Mat-Faced Type: Gypsum wallboard, as defined in ASTM C1658/C1658M.
4. Type: Fire-resistance-rated Type X, UL or WH listed.
5. Thickness: 5/8 inch (16 mm).
6. Microbial Resistance (ASTM D6329, EPA 12-week protocol): Will not support microbial growth.
7. R-Value (ASTM C518): 0.67.
8. Nail Pull Resistance (ASTM C473, ASTM C1658): Not less than 90 lbf.
9. Humidified Deflection (ASTM C473, ASTM C1658): Not more than 1/8 inch.
10. Hardness, Core, Edges, and Ends (ASTM C473, ASTM C1396, ASTM C1658): Not less than 15.
11. Water Absorption (ASTM C630, ASTM C1396, ASTM C1658): Less than 5 percent of weight.
12. Edges: Tapered.
13. Products:
    a. Georgia-Pacific Gypsum; DensArmor Plus Abuse-Resistant.

D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 1/2 inch (13 mm).
3. Edges: Tapered.
4. Products:
    a. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board: www.gpgypsum.com/#sle.

E. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Roof boards, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Fungal Resistance: No fungal growth when tested in accordance with ASTM G21.
4. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
5. Core Type: Type X.
6. Type X Thickness: 5/8 inch (16 mm).
7. Edges: Square.

2.3 GYPSUM BOARD ACCESSORIES

A. Water-Resistive Barrier: See Section 07 2500.

B. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
1. Types: As required for finished appearance.
2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
3. Products:
    a. Same manufacturer as framing materials.
    b. Substitutions: See Section 01 6000 - Product Requirements.

C. Joint Materials: ASTM C475 .
1. Mold resistant and asbestos free.
2. Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners.
3. Ready-mixed vinyl-based joint compound.
4. Powder-type vinyl-based joint compound.

D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 .

B. Provide metal Bracing: at midpoint up to 8' 0"; at third point over 8'-0".

C. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs minimum 16 gauge..

E. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, toilet accessories, and hardware. Comply with Section 06 1054 for wood blocking.

F. Suspended Ceiling and Soffits: Space framing and furring members as indicated.

3.3 BOARD INSTALLATION

A. Comply with ASTM C 840.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

D. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

E. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.

B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.5 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, bedded with powder-type vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

3.6 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.7 FINISH LEVEL SCHEDULE

A. Level 1: Above finished ceilings concealed from view.

B. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.

END OF SECTION

SECTION 09 2662
GYPSUM SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. This Section includes:
   1. Gypsum sheathing attached to steel framing members in exterior walls and ceilings (behind exterior finish).

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section - 05 4000 - Cold-Formed Metal Framing.
   2. Section - 07 2500 - Weather Barriers.
   3. Section - 07 4113 - Metal Roofing.
   4. Section - 09 2116 - Gypsum Board Assemblies

1.3 DEFINITIONS:

A. Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.4 SUBMITTALS:

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
   1. Product data for each grade of gypsum sheathing indicated.
   2. Product data for air/moisture resistant barrier and tape.
   3. Research reports or evaluation reports from the model code organization acceptable to authorities having jurisdiction evidencing compliance of air-infiltration barrier with building code in effect for Project.
   4. Sample: 6” x 6” sheathing.

1.5 QUALITY ASSURANCE:

A. Fire-Test-Response Characteristics: Where gypsum sheathing is part of fire-resistance-rated assemblies, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Resistance Ratings: As indicated by reference to GA File Nos. in GA 600 "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Single-Source Responsibility: Obtain gypsum sheathing for Project from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver gypsum sheathing board and related materials in original packages bearing brand name and identification of manufacturer.

B. Store gypsum sheathing board so that it is protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Neatly stack gypsum sheathing boards flat on leveled supports off the ground under protective covering.

C. Handle gypsum sheathing board to prevent damaging edges, ends, backs, or faces.

1.7 SEQUENCING AND SCHEDULING:

A. Sequence installing gypsum sheathing board with installing exterior cladding to comply with requirements indicated below:

B. Do not leave gypsum-sheathing board exposed to weather for more than 1 month or for more than 6 months if protected as indicated in Part 3 "Protection" article.

PART 2 - PRODUCTS

2.1 GYPSUM SHEATHING BOARD:

A. Glass-Mat Gypsum Board: Gypsum board designed as an exterior substrate for a weather barrier, consisting of a noncombustible water-resistant core, essentially gypsum, surfaced with glass mats on face and back, partially or completely embedded in core, and with unsurfaced square edges. Comply with ASTM C 1177 and requirements indicated below:

1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
2. Fungal Resistance: No fungal growth when tested in accordance with ASTM G21.
3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Core Type: Type X.
5. Thickness: 5/8 inch (16 mm),unless indicated otherwise
6. Edges: Square.
7. Size: 4 feet by 8 feet
8. Use: All gypsum sheathing applications.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Dens-Glass Gold Fireguard Exterior Guard as manufactured by Georgia-Pacific Corp or equivalent.

C. Accessory Materials:

1. Fasteners: Type S-12, minimum 1”, stainless steel drill screws to attach to metal framing.

D. Substitutions: 01 2500 - Substitution Procedures

2.2 WEATHER RESISTIVE BARRIER

A. Refer to Section 07 2500 - Weather Barriers

B. Furnish and install air barrier/weather resistant barrier over exterior wall sheathing at all locations regardless of whether or not indicated on drawings to protect exterior sheathing.

PART 3 - EXECUTION

3.1 GYPSUM SHEATHING BOARD

A. Preparation: Examine subframing; verify that surface of framing and furring members to receive sheathing does not vary more than 1/4" from the placement of faces of adjacent members.

B. Installation: General: Install gypsum sheathing to comply with manufacturer's instructions, GA-253, and the following:

1. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.
2. Coordinate sheathing installation with flashing and joint sealant installation so that these combined materials are installed in the sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.
3. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards but do not cut into face paper.
4. Do not bridge building expansion joints with gypsum sheathing; cut and space edges to match

a. spacing of structural support elements.

5. Install sheathing with gold side out.

6. Install gypsum-sheathing boards with edges centered over flanges of steel studs or furring. Abut ends and edges of each board with those of adjoining boards. Screw-attach boards at perimeter and within field of board to each steel stud as follows:
   a. Metal framing: Fasten sheathing to metal framing with screws spaced 8" o.c.at perimeter where there are framing supports; and 8" o.c. along intermediate framing in field.
   b. Locate fasteners minimum 3/8" from edges and ends of sheathing panels.
   c. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
   d. Use maximum lengths possible to minimize number of joints.
   e. Metal framing: Fasten sheathing to metal framing with screws spaced 8" o. c. at perimeter

3.2 WEATHER RESISTIVE BARRIER

A. Refer to Section 07 2500 - Weather Barriers.

3.3 PROTECTION:

A. Protect cutouts, corners, and joints in the sheathing by filling with a flexible sealant or by applying sheathing tape recommended by sheathing manufacturer at the time sheathing is applied.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Stone thresholds.

1.3 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

B. Section 09 6725 - Epoxy Resin Flooring.

1.4 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.

1. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).
2. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).
3. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).
4. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
5. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
6. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
7. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).
8. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.
9. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.
10. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; 2008 (Reaffirmed 2013).
11. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.

B. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2017.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

E. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. Maintenance Materials: Furnish the following for Brewster Central School District's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Tile: 10 square feet (1 square meters) of each size, color, and surface finish combination.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.7 MOCK-UPs

A. See Section 01 4000 - Quality Requirements for general requirements for mock-up.

B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.

1. Minimum size of mock-up is indicated on drawings.
2. Approved mock-up may remain as part of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS

2.1 TILE

A. Manufacturers: All products of each type by the same manufacturer.

1. Dal-Tile Corporation: www.daltile.com/#sle.
   a. See Finish Schedule for colors and dimensions..
2. Casalgrande Padana.
   a. Basaltina / Pantelleria . See Finish Schedule for colors and dimensions.
3. Substitutions: Section 01 2500 Substitution Procedures.

B. Glazed Wall Tile: ANSI A137.1, standard grade and as follows:

1. Size: Varies, see Finish Schedule..
2. Edges: Cushioned.

3. Surface Finish: Gloss .
4. Color(s): As indicated on drawings.
5. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes indicated.
6. Substitutions: Section 01 2500 Substitution Procedures.

C. Porcelain Tile: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
2. Size: 12 x 24 inch (- mm), nominal.
3. Thickness: 3/8 inch (9.5 mm).
4. Edges: Square.
5. Floor Surface Finish: Matte glazed, Non slip.
6. Color(s): As indicated on drawings.
7. Pattern: As indicated on drawings..
8. Products:
Florida Tile Inc., Lexington Ky.
a) Canal Street, see Finish Schedule for colors and dimensions.

2.2 TRIM AND ACCESSORIES

A. Thresholds: Marble, color as selected by the architect.Honed finish; wide by full width of wall or frame opening; Cope ends of the saddle to match the profile of the door frame. Saddle shall be 1/2 inch thick (12.7 mm thick); beveled one long edge with radiused corners on top side; without holes, cracks, or open seams. Profile shall be ADA compliant.
1. Applications:
a. At doorways where tile terminates.
b. At open edges of floor tile where adjacent finish is a different height.
c. Where indicated on the drawings.

2.3 ADHESIVE MATERIALS

A. Manufacturers:
1. Mapei Corporation; Product Ultralite Mortar Pro: www.mapei.com.
2. Substitutions: Section 01 2500 Substitution Procedures.

B. Polymer-modified mortar.(Thinset Installation Methods): ANSI A118.4, composed as follows:
1. Single component setting system.

2.4 WATERPROOFING/CRACK ISOLATION FOR THIN-SET TILE INSTALLATIONS

A. Acrylic based, roller applied waterproofing/crack isolation system
1. Mapelastic HPG; Mapei Corporation
2. Mapei Aqua Defense. For use over primer.

2.5 GROUTS

A. Manufacturers:
1. Mapei Corporation ; Product Mapei Ultracolor, Plus FA
2. Substitutions: Section 01 2500 Substitution Procedures.

B. Color(s): Selected by Architct from the manufacturers full range..

2.6 ACCESSORY MATERIALS

A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers

D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.
   1. Products: MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout
      a. Provide sealer coat over all tile floors

E. Expansion Joints: Provide expansion joints for Unglazed Porcelain Tile on each column line and as recommended by the TCA Handbook for the installation reference EJ171-04 manufacturer.
   1. Schluter Dilex as manufactured by Schluter Systems.
      a. PVC anchor legs and side sections, with chlorinated polyethylene sealant

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
   1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft (7.1 kg per 100 sq m) per 24 hours, test in accordance with ASTM F1869.
   2. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.3 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1A thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install thresholds where indicated.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive. Refer to TCNA (HB) EJ 171 for location and frequency of joints.

I. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

3.5 INSTALLATION - WALL TILE

A. Over interior concrete and masonry install in accordance with TCNA (HB) Method thinset with specified product..

3.6 CLEANING

A. Clean tile and grout surfaces.

3.7 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Acoustic Clouds

D. Acoustic Blades - Wall Mounted

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of special anchors or inserts for suspension system.

C. Section 05 3100 - Steel Decking: Placement of special anchors or inserts for suspension system.

D. Section 05 4000 - Cold-Formed Metal Framing.

E. Section 07 4213 - Aluminum Soffit Panels.

F. Section 07 9200 - Joint Sealants: Acoustical sealant.

G. Divisions 22, 23, and 26 for fire alarm, air outlets and inlets, and light fixtures

1.4 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

F. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

G. Ceilings and Interior Systems Construction Association (CISCA): Code of Practices.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 12 x 12 inch (300 by 300 mm) in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches (300 mm) long, of suspension system main runner.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Materials: Furnish the following for Brewster Central School District's use in maintenance of project.
   1. Extra Acoustical Units: Quantity equal to 5 percent of total installed of each tile type.

1.7 QUALITY ASSURANCE

A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.

B. Fire Performance: ASTM E84 surface burning characteristics. Flame Spread index 25 or less. Smoke development index 50 or less. (UL Labeled) Class A in accordance to ASTM E1264

C. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

E. Installers Qualifications: Company specializing in the installation of acoustical ceilings specified in this section with minimum 5 years documented experience.

F. Pre-installation Conference: Conduct conference at Project site minimum one week before installation. Agenda shall include project conditions, coordination with work of other trades, and layout of items which penetrate ceilings.

1.8 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements.

B. Deliver extra acoustical units for Owner's use in maintenance. Label and store where directed by the Owner including codes used on the Drawings. Do not deliver to the Project site until the Owner is prepared to receive and store maintenance materials.
   1. Tile: Furnish 5 percent of total acoustic unit area of extra tile to Owner.
   2. Panels: Furnish 5 percent of total acoustic unit area of extra panels to Owner.
   3. Suspension System Components: Furnish 5 percent of each exposed component of the quantity installed

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet conditions such as concrete, plaster, paint, and adhesives have been completed and cured.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect system components from excessive moisture in shipment, storage, and handling

1.10 WARRANTY

A. Warranty: Provide manufacturer's standard warranty against manufacturing defects in material or workmanship when installed in accordance with the current CISCA Handbook and ASTM C367:
   1. Armstrong Warranty Period: 30 years.

1.11 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. Substitutions: See Section 01 2500 - Substitution Procedures.

B. Suspension Systems:
   1. Armstrong World Industries, Inc; Prelude XL and Axiom Vector Inverted Trim: www.armstrong.com.
   2. Substitutions: See Section 01 2500 - Substitution Procedures.

2.2 ACOUSTICAL UNITS

A. Armstrong World Industries, Inc: www.armstrong.com.

B. Acoustical Panels, Type ATC-1: Wet formed mineral fiber with acoustically transparent membrane with factory applied latex paint, with the following characteristics:
   1. Classification: ASTM E1264 Type IV.
      a. Pattern: E, smooth texture..
   2. Size: 24 by 48 inches (610 by 1219 mm).
   3. Thickness: 7/8 inch (22 mm).
   4. Fire Class A
   5. R Value: 2.2 BTU Units
   6. Light Reflectance:.88 percent, determined in accordance with ASTM E1264.
   7. NRC Range:.75 determined in accordance with ASTM E1264.
   8. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
   9. Panel Edge: Square.
   10. Color: White.
   11. Suspension System: Exposed grid.
   12. Products:
      a. ULTIMA - High NRC.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Acoustical Tile Type ACT 2: Acoustically transparentwith wet formed mineral fiber Type: IV, Form: 2, Pattern: E with the following characteristics:
   1. Size: 24 by 24 inches (- by - mm).
   2. Thickness: 1 inches (- mm).
   3. Texture: Smooth.
   4. Light Reflectance:.85 percent, determined in accordance with ASTM E1264.
   5. Sag/Humidity Resistance: HumiGuard Plus.
   6. Fire Performance: Class A UL
   7. Insulation Value: R Factor-BTU: 2.9 BTU.
   8. Mold And Mildew Resistant: BioBlock.
   9. Water Repellent.
   10. Soil Resistance.
   11. Wash and scrubbable.
   12. Edge: Square.
   13. Surface Color: White.
   14. Suspension System: Exposed grid Type Prelude XL.
   15. Products:
      a. CALLA Health Zone.

D. Acoustical Tile Type ACT 3,4,5 & 6.: See Finish Schedule Legend for colors) with the following characteristics:
   1. Size: 24 by 24 inches (600 by 1200 mm).
   2. Thickness: 1 inches (- mm).
   3. Texture: Smooth.
   4. Light Reflectance: 0.68 percent, determined in accordance with ASTM E1264.
   5. NRC Range: 1.0 to 1.0, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 22, determined in accordance with ASTM E1264.
   7. Sag/Humidity Resistance: Up to 100 %.
   8. Fire Performance: Class A; UL723 (ASTM E84) Flame Spread Index: 0;
      a. Smoke Developed Index (UL Labeled): 5.
   9. Insulation Value: R Value (BTU Units): 14
   10. Mold And Mildew Resistant.
   11. Water Repellent.
   12. Soil Resistance.
   13. Wash and scrubbable.
   14. Edge: Square tegular.
   15. Surface Colors (4) : As indicated on drawings.
   16. Suspension System: Exposed grid Type AXIOM Vector Inverted.
   17. Products:
      a. Calla ceiling tile.

E. Wall Mounted Acoustic Blade: (Linear acoustic wall Panel) See drawings for locations, including sloped ceiling areas. Provide mounting accessories as required,
   1. Size: 5" x 46" x 2"
   2. NRC Range: up to .80 based on spacing. , determined in accordance with ASTM E1264.
   3.
   4. Panel Edge: Square. Scrim ALL edges (Premium)
   5. Surface Pattern: fine texture.
   6. Surface Colors: Multiple color scheme. As indicated on drawings.
   7. Products: Soundscapes Blades, include direct attach Axiom Wall Molding.

2.3 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Armstrong World Industries, Inc; Product Prelude XL 15/16": www.armstrong.com.
   2. Structural Classification: Intermediate duty, ASTM C 635.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee; 15/16 inch (24 mm) wide face.
   2. Construction: Double web.
   3. Finish: White painted.
   4. Use for all ACT, unless otherwise noted.
   5. Products: Prelude XL

D. Exposed Aluminum Suspension System: Extruded aluminum. (Prelude XL suspension system with the Axiom perimeter)
   1. Profile: Angle edge, 6" ht.; wide face. Size and shape as indicated on the drawings.
   2. Finish: Painted white.

3. Use for ACT 3,4,5&6.
4. Products: AxiomVector Inverted Trim.

2.4 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
2. Minimum 7/8" horizontal flange
3. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

D. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

E. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 9200 - Joint Sealants.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Install in bed of acoustical sealant.
2. Use longest practical lengths.
3. Overlap and rivet corners.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit round and irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

G. Install seismic clips or stabilizer bars as per code requirements.

3.4 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.5 CLEANING

A. See Section 01 7000 - Execution for additional requirements.

B. Replace damaged or abraded components.

3.6 ADJUSTING AND CLEANING

A. Replace damaged or broken material, Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with mfg,, touch up procedures using touch up paint as required for small nicks and minor scratches in the surface, Remove and replace any work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
   1. Provide touch up kit for Owner's use.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Moisture mitigation testing.

B. Resilient tile flooring.

C. Sheet vinyl flooring.

D. Resilient base.

E. Installation accessories.

F. Substrate repair

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

C. Section 03 5400 - Cast Underlayment.

D. Section 123200 - Plastic Laminated Casework for rubber base requirements.

1.4 REFERENCE STANDARDS

A. ASTM D2047 - Static coefficient of friction.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM E492 -Acoustical.

D. ASTM E662 - Smoke Density.

E. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

F. ASTM F137 - Flexibility.

G. ASTM F410 WeatrLayer Thickness.

H. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

I. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.

J. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2017.

K. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004, with Editorial Revision (2014).

L. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2014).

M. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.

N. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

O. ASTM F1869 - Test Method for Measuring Moisture Vapor Emissions in Concrete.

P. ASTM F1914 - Residual Indentation.

Q. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015, with Editorial Revision (2016).

R. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs.

S. ASTM F2420 - Standard Test Method for Determining Relative Humidity on the Surface of Concrete

T. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.

U. EN 1815 - Electrostatic Propensity.

V. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

W. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.5 QUALITY ASSURANCE

A. Manufacturer: Provide resilient flooring manufactured by a firm with a minimum of 10 years' experience with resilient flooring of types equivalent to those specified. Manufacturers proposed for use, which are not named in this section, shall submit evidence of ability to meet performance requirements specified as per Section 01 2500 - Substitution Procedures.

1. Color Matching: Provide resilient flooring products, including wall base and accessories, from one manufacturer to ensure color matching.
2. Manufacturer capable of providing technical training and field service representation.

B. Installer Qualifications: Installer shall be recognized and approved by the manufacturer for the requirements of the project or INSTALL (International Standards & Training Alliance) resilient certified for the requirements of the project.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 12" x 12" in size illustrating color and pattern for each resilient flooring product specified.

D. Concrete Testing Standard: Submit a copy of ASTM F710.

E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

G. MSDS (Material Safety Data Sheets) should be submitted for all adhesives used:

1. Membrane, primer, patch, leveler, heat weld rod, cold weld, liquid wax and cleaning agents

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum ten (10) years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum five (5) years documented experienceand approved by flooring manufacturer.

C. Expansion spacing will be installed to allow for normal expected increases in Equilibrium Wood Moisture Content (EMC)

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store all materials off of the floor in an acclimatized, weather-tight space.

B. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions

C. Deliver materials sufficiently in advance of installation to condition materials to the required temperature prior to installation

D. Store sheet goods upright on a clean, dry, flat surface protected from all possible damage and from exposure to harmful weather conditions. Store tiles on a clean, dry, flat surface, carefully protecting corners and edges from all possible damage and from exposure to harmful weather conditions.

E. Protect roll materials from damage by storing on end.

F. Do not double stack pallets.

1.9 MOCK UP

A. Size of mock-up to be not less than 60 inch (1500 mm) long by 60 inch (1500 mm) wide.

B. See Section 01 4000 - Quality Requirements for additional requirements.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.10 MAINTENANCE

A. Extra Materials: Furnish one box of tile for each fifty boxes or fraction thereof, for each type, color, pattern and size of the tile installed, from same manufactured lot as materials installed.

1. Deliver extra tile to Owner after completion of work.
2. Furnish tiles in protective packaging with identifying labels.

1.11 FIELD CONDITIONS

A. Maintain minimum room temperature of 65 degrees F (18 degrees C) for a period of two days prior to delivery of materials to installation space, during installation, and after installation.

B. Acclimate wood flooring materials to installation space a minimum of 48 hours prior to installation.

C. Store materials for not less than 48 hours before, during, and 72 hours after installation, in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

D. Store sheet goods upright on a clean, dry, flat surface protected from all possible damage and from exposure to harmful weather conditions. Store tiles on a clean, dry, flat surface, carefully protecting corners and edges from all possible damage and from exposure to harmful weather conditions.

1.12 PRE-INSTALLATION TESTING

A. Conduct pre-installation testing as follows:

1. ASTM F-1869 Test Method for Measuring Moisture Vapor Emissions in Concrete Maximum: 3 lbs/1000 SF
2. ASTM F-2170 Test Method for Determining Relative Humidity in Concrete: Maximum RH: 55%.

1.13 WARRANTY

A. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.

B. Provide manufacturer's non-prorated ten (10) year limited warranty to be free from defects in material and workmanship, under normal use and service, to repair or replace all defective tiles including reasonable labor.

PART 2 PRODUCTS

2.1 SHEET FLOORING

A. Acoustic Homogenous Vinyl Sheet Flooring - Type ACF-1: Color and pattern throughout wear layer thickness.
   1. Manufacturer:
      a. Tarkett North America, tarkett.com
      b. Substitutions: Sec Section 01 2500 - Substitution Procedures
   2. ASTM E 662/NFPA 258 (Smoke Density), less than 450
   3. VOC Content Limits: As specified in Section 01 6116.
   4. Chemical Resistance (ASTM F 925): Passes.
   5. Total Thickness:.080 inch (2 mm) minimum.
   6. Sheet Width: 78 inch (1950 mm) minimum.
   7. Static Load Resistance: 250 psi (- kPa) minimum, when tested as specified in ASTM F970.
   8. Static coefficient of friction (ASTM D 2047): > 0.5
   9. Seams: Heat welded.
   10. Acoustical (ASTM E 492)
   11. Color: As indicated on drawings.
   12. Warranty: Provide manufacturer's standard Twenty year warranty.

B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.2 TILE FLOORING

A. Homogenous Vinyl Composition Tile: HVT -1 & HVT -2: Homogeneous, with color extending throughout thickness.
   1. Manufacturers:
      a. As indicated on finish schedule drawing.
      b. TOLI International, a Division of CBC (AMERICA) Corp, Telephone: 800.446.5476;: 800.446.5476; Fax: 631.864.8151; E-mail; Product Fasol Plus.
      c. Substitutions: Sec Section 01 2500 - Substitution Procedures
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   4. Size: 18" x 18"
   5. VOC Content Limits: As specified in Section 01 6116.
   6. Thickness:.120 inch (3 mm).
   7. Pattern: As indicated on drawings.
   8. Adhesives: As recommended by the manufacturer.
   9. Color: As indicated on drawings.

B. Quartz - composition tile: QT-1, QT-2 & QT-3
   1. Manufacturers:
      a. UPOFLOOR Quartz Tiles
         Upofloor Americas Inc; 940 Center Circle, Suite 1000 Altamont Springs, FL. 32714
      b. Product: Mosaic, Tema line.
      c. Substitutions: Sec Section 01 2500 - Substitution Procedures
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   3. VOC Content Limits: As specified in Section 01 6116.

4. Square Tile Size: 24 by 24 inch (610 by 610 mm).
5. Weight; 0.82 lbs/sq.ft
6. Total Thickness:.08 inch (2 mm).
7. Pattern and Color: As indicated on drawings..
8. Static Load Limit : 3500 psi
9. SCOF : less than .5
10. Class I per NFPA 101.
11. Floorscore Certificate: SCS-FS-02258

2.3 STAIR COVERING

A. Stair Treads and Risers: Rubber; full width and depth of stair tread in one piece; tapered thickness; Provide rubber inserts nosing not less than 2 inch (- mm) deep.
   1. Manufacturers:
      a. Roppe Corporation; Rubber Stair Treads: www.roppe.com/#sle.
      b. Substitutions: Sec Section 01 2500 - Substitution Procedures
   2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
   3. Nominal Thickness: 3/16 inch (4.76 mm). ASTM F386
   4. Nosing: As shown on drawings.
   5. Striping: 2 inch (24 mm) wide contrasting color abrasive strips.
   6. Texture: Hammered.
   7. Color: As indicated on drawings.
   8. Depth: As shown on drawings.

2.4 STAIR COVERING

A. Stair landings: Rubber tile.
   1. Size: 24"x24".
   2. Thickness: 1/8".
   3. Manufacture as indicated on finish schedule. (Match stair riser/tread)
   4. Color and pattern as indicated on finish schedule.

2.5 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and Style A straight for carpet installation as follows:
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company: www.johnsonite.com.
         a) TA8 Welsh Castle CB
      b. Substitutions: Sec Section 01 2500 - Substitution Procedures
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   3. Height: 2 1/2 inch & 4 inch (100 mm). See drawings for locations.
   4. Thickness: 0.125 inch (3.2 mm).
   5. Finish: Satin.
   6. Length: Roll.
   7. Color: As indicated on drawings.

2.6 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Trowelable Leveling and Patching Compounds: Latex-modified, Portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated

C. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
   1. VOC Content Limits: As specified in Section 01 6116.

D. Vinyl Tile Adhesives: Latex adhesive, non-flammable, moisture and alkali resistant bond.
   1. Adhesive shall be as recommended by the manufacturer, compatible with tile and substrate.

E. Quartz Composition Tile Adhesive:
   1. Excelsior EW710 epoxy wet set adhesive as manufactured by Roppe. Two-part urethane modified epoxy adhesive. Verify compatibility with the quartz tile. Provide written letter from the quartz tile manufacturer confirming compatibility. Spread rate and trowel size for heavy-duty rolling loading, per manufacturer recommendations.

F. Moisture Control System: One-coat moisture control system that suppresses excessive moisture vapor emissions in existing concrete prior to the installation of finished flooring.
   1. Product: Ardex MC Rapid, Moisture Control System, Ardex Engineered Cements, 400 Ardex Park Drive, Aliquippa, PA 1500, 888-512-7339, www.ardex.com.

G. Moldings, Transition and Edge Strips: Where indicated on drawings..
   1. Manufacturers:
      a. Johnsonite; rubber transition strips..
      b. Substitutions: Sec Section 01 2500 - Substitution Procedures

H. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Moisture Testing: Moisture testing shall be performed using ASTM test method ASTM F 2170 in situ Relative Humidity Test. The acceptable test result when using test method F 2170 should not exceed seventy five per cent (75%) AND pH readings should not exceed 9.0.

E. Verify that existing concrete sub floor do not containing curing compound by placing 1/4 cup of water on surface. If water beads up scarify surface.

F. Verify that required floor-mounted utilities are in correct location.

G. @ Quartz Composition Tile

When flooring is being installed directly over concrete, concrete surfaces that have an ICRI Concrete Surface Profile (CSP) over 4 should be flattened with a self-leveling underlayment or a patch to prevent imperfections from telegraphing through flooring materials.

New concrete substrates on all grade must be tested in accordance with ASTM F2170, using in situ Probes (such as Wagner Rapid RH), to quantitatively determine the amount of relative humidity no more than one week prior to the installation.

If ASTM F2170 or ASTM F1869 test results exceed the prescribed limits, a moisture mitigation product, such as Excelsior MM-100 Moisture Mitigation, must be installed prior to proceeding with installation. Install The MM-100 per technical data sheet at a rate of 400 sq. ft. per gallon. When installing over concrete as moisture mitigation, material must be applied in two coats. Do not install flooring until moisture testing has been conducted per the appropriate standard and/or moisture mitigation has been installed and is dry to the touch. Do not install flooring in below grade areas when hydrostatic pressure is visible or suspected.
If ASTM F2170 and ASTM F1869 test results are below recommended limits, concrete substrates must be tested for elevated pH and alkalinity in accordance with ASTM F710.
If pH testing per ASTM F710 exceeds the prescribed limits, the concrete must be sealed with the Excelsior MM-100 Moisture Mitigation prior to proceeding with installation. Install the MM 100 per technical data sheet at a rate of 400 sq. ft. per gallon.
When installing MM-100, apply a minimum of 1 coat. Do not install flooring until material is dry to the touch.
Verify remedial actions with the manufacturer representative.

3.2 PREPARATION

A. Remove existing carpet, resilient flooring and flooring adhesives; follow the recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Concrete substrate that fully conforms to the requirements of ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring is required, or as detailed in the manufacturer's Installation Guide.

D. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface up to 1/2".

E. Remove dexterous coatings from subfloor substrates that would prevent a positive adhesive bond, such as curing compounds incompatible with adhesive, paints, oils, adhesives, wax and sealers.

F. Completely remove existing solvent base adhesives to prevent bleeding and staining

G. **Mechanically profile with grinder 100% of all existing substrates receiving resilient flooring. Provide dust control as required.**

1. After profiling test substrate by place drop of water, or other means to insure all coatings, sealers etc have been removed. Repeat profiling if necessary**.**

H. Provide leveling compound over 100% of all existing substrates receiving resilient flooring

I. Prohibit traffic until filler is fully cured.

J. Clean substrate.

3.3 INSTALLATION GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Do not install resilient flooring over building expansion joints.

D. Do not install defective or damaged resilient flooring.

E. Layout resilient flooring to provide equal size at perimeter. Adjust layout as necessary to reduce the amount of resilient flooring which is cut to less than half full width.

F. Lay resilient flooring with arrows in the same direction (excluding borders).

G. Install resilient flooring without voids at seams. Lay seams together without stress.

H. Spread only enough adhesive to permit installation of materials before initial set.

I. Fit joints and butt seams tightly.

J. Set flooring in place, press with heavy roller to attain full adhesion.

K. Roll joints with minimum 50# roller. Follow manufacturers additional instruction where applicable.

L. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

M. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

N. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

O. Remove excess adhesive immediately

3.4 INSTALLATION SHEET FLOORING

A. Install resilient sheet goods in accordance with Manufacturer’s current printed Installation Manual.

B. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

C. Cut sheet at seams in accordance with manufacturer's instructions.

D. Seal seams by heat welding where indicated.

E. Finish seams in sheet rubber by heat welding.

1. Rout seams and weld together with coordinated colored heat welding rod or with coordinated colored cold weld compound in accordance with the manufacturer's instruction.

3.5 INSTALLATION TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half of a tile at perimeter.

D. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles

1. Lay tiles with grain running in one direction for multicolor tiles.
2. Lay tiles in pattern of colors and sizes indicated on Drawings.

3.6 INSTALLATION RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.7 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.8 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

C. Cleaning of Homogenous Vinyl Composition Tile
   1. Sweep or dust mop to remove dirt and grit. Do not use treated dust mops.
   2. Add heavy duty cleaner to cool water following the manufacturer's instructions.
   3. Scrub with a 175-rpm machine or auto scrubber. Use a blue or green pad. Always wet the pad before use. Do not use a black or a build-up removal pad.
   4. Remove the solution with a wet-dry vacuum or auto scrubber until floor is dry and free of residue.
   5. Rinse the floor with clean water. Repeat the rinse process as necessary to remove all haze and residue.
   6. Apply three to five coats of high gloss or matte floor finish following the manufacturer's instructions.
   7. Owner shall wax all VCT flooring

D. Cleaning of Vinyl Sheet Flooring
   1. 72 hours after installation is completed, initial maintenance procedures must be implemented in accordance with manufacturer's requirements
   2.

E. Cleaning of rubber flooring:
   1. Cleaning: Flooring surface shall have the ability to be cleaned and maintained without the use of any chemicals that may be hazardous or containing any teratogenic, mutagenic or any other ingredients known to be carcinogenic. Manufacturer shall make available a cleaning system that effectively cleans the flooring surface using water, cleaning pads and a suitable cleaning machine, without the use of factory and/or field-applied coatings.
   2. Shine: Higher shine surfaces can be achieved by dry buffing without any artificial topical applied coatings

3.9 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation and 72 hours heavy rolling loads.

3.10 SCHEDULE

A. Refer to Finish Schedule on drawings

END OF SECTION

SECTION 09 6623
RESINOUS MATRIX TERRAZZO TILE

PART 1 GENERAL

1.1 1.1 RELATED DOCUMENTS

A. 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 SECTION INCLUDES

A. Recycled aggregates and glass terrazzo tile and accessories.

1.3 REFERENCES

A. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.

B. ASTM D 2047 - Standard Test Method for Static Coefficient of Polish-Coated Floor Surfaces as Measured by the James Machine.

C. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness.

D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

F. ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

G. ASTM F 510 - Standard Test Method for Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method.

H. ASTM F 540 - Standard Test Method for Squareness of Resilient Floor Tile by Dial Gage Method.

I. ASTM F 925 - Standard Test Method for Resistance to Chemicals of Resilient Sheet Flooring.

J. ASTM F 970 - Standard Test Method for Static Load Limit.

K. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

L. MIL D-3134 - Deck Covering Materials; Revision J, Addendum 1

1.4 SYSTEM DESCRIPTION

A. Performance Requirements of Terrazzo Tiles:

1.	Abrasion Resistance: ASTM D-04060.	35 mg
2.	Compressive Strength: ASTM C-579, 7 days.	10,000 psi minimum
3.	Indentation: MIL-D3134f	2,000psi/30 min.= 0 indent
4.	Slip Resistance: ASTMD 2047.	Wet: .62, Dry: .85.
5.	Fire Rating:	Class A
6.	Flame Spread Index: ASTM E 84.	Class 1
7.	Smoke Density: ASTM E 662	
8.	Critical Radiant Flux:ASTM E 648.	Class 1

1.5 SUBMITTALS

A. Submit in accordance with Section 013000

B. Submit manufacturer's specifications and technical data for precast terrazzo tile and accessories; including manufacturer's printed installation instructions and maintenance manuals for each material specified.

C. Samples for Selection: Submit manufacturer's samples of actual sections of tile and accessories; include manufacturer's full range of color and patterns available.

D. Samples for Verification Prior to Installation: Submit full size samples of all types, colors, and patterns selected, indicating full range of patterning and color variations.

E. Test Reports: Submit test reports for bond and moisture tests of substrates.

F. Certificates: Submit certificates from manufacturer stating compliance with applicable requirements for materials specified.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has at least three years of experience with the installation of precast terrazzo tile and has successfully completed installations of a similar size and scope.

B. Regulatory Requirements: Comply with requirements of local building codes and applicable regulations of other government authorities.

C. Pre-Installation Meeting: Meet with tile manufacturer's representative and Owner prior to preparation of substrate and installation of tile, to review manufacturer's instructions and requirements to ensure the tile is installed properly.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages, containers or bundles bearing brand name and identification of manufacturer.

1.8 Store materials inside, under cover in a manner to keep them dry, protected from the weather, direct sunlight, surface contamination, corrosion, and damage from construction traffic and other causes.

1.9 PROJECT CONDITIONS

A. Maintain minimum temperature of 70 degrees F (21 degrees C) in spaces to receive terrazzo tile, for at least 48 hours before, during and after installation. Store materials in space where they will be installed for at least 48 hours or as required ensuring that the materials have reached 70 degrees F (21 degrees C) before staring installation.

B. Install terrazzo tile and accessories after other finishing operations, including painting, have been completed.

C. Do not install terrazzo tile on concrete slabs until they have been cured and are sufficiently dry to achieve bond with adhesives, as determined by the tile manufacturer's recommended bond and moisture test. Allow sufficient time for the slab to dry out before installation is started.

D. Provide adequate lighting to allow for proper installation.

E. Do not use portable or temporary heat.

1.10 WARRANTY

A. Submit 20 year wear warranty written material warranty from tile manufacturer warranting that tile is free from defects in workmanship and material.

B. Products must be installed so as not to void the manufacturer's warranty for wear.

C. Warranty shall be in form acceptable to Owner.

1.11 MAINTENANCE

A. Extra Materials: Furnish one box of tile for each fifty boxes or fraction thereof, for each type, color, pattern and size of the tile installed, from same manufactured lot as materials installed.

1. Deliver extra tile to Owner after completion of work.
2. Furnish tiles in protective packaging with identifying labels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Nurazzo, P.O. Box 1208 Dalton, Ga.; www.nurazzo.com

B. Requests for substitutions will be considered in accordance with provisions of Section 016000

C. Obtain all materials including terrazzo tile and recommended adhesives and leveling compounds from a single manufacturer.

2.2 MATERIALS

A. Terrazzo Tile: Marble or granite chips, recycled glass, embedded in epoxy resin binding matrix.
   1. Pattern: As indicated on drawings.
      a. Thickness: 1/4"
      b. Colors and Styles: As indicated on Finish Schedule Legend.
      c. Size: 24 by 24 inches (610 by 610 mm), nominal.
      d. Color Match: Obtain all tile materials from same production run.

B. Patching Compound for Small Areas:
   1. White premix latex; type recommended by adhesive material manufacturer.

C. Floor Adhesive:
   1. Nurazzo 2100.

D. Grout:
   1. Spectralock Pro Premium epoxy grout; Laticrete International.

PART 3 EXECUTION

3.1 EXAMINATION

A. Concrete Subfloor:
   1. Inspect subfloor to verify that it is clean, flat, smooth, level and free from cracks, holes, ridges, coatings preventing adhesion, and other defects impairing performance or appearance.
   2. Notify Architect of conditions that would adversely affect flooring installation; do not proceed until defective conditions have been corrected.
   3. Do not proceed until substrate preparation is complete and satisfactory, bond and moisture tests are completed and test reports submitted which indicate that bond and moisture values meet specified requirements.

B. Coordinate work with that of other installers prior to installation so that tile work fits properly with doors, frames, saddles, floor drains, and other adjacent work.

C. Start of work constitutes acceptance that conditions are satisfactory.
   1. Close the space and areas where flooring is being installed to traffic and other installers until flooring has set and sealing and finish of tiles are complete.

3.2 PREPARATION

A. Fill small cracks, holes and depressions in subfloors using leveling and patching compounds recommended by tile manufacturer.

B. Provide skim coat of leveling compound over 100% of underlayment.

C. Remove deleterious coatings from subfloor surfaces that would prevent a positive adhesive bond; such as curing compounds incompatible with adhesives, paints, oils, adhesives, waxes and sealers.

D. Completely remove existing solvent-based adhesives to prevent bleed through and staining.

E. Remove existing floor covering and condition subfloor to provide smooth, clean continuous surface; level subfloor with self-leveling compound in compliance with tile manufacturer's specifications and installation instructions.

3.3 INSTALLATION

A. Comply with manufacturer's instructions for terrazzo tile installation.
   1. Scribe, cut and fit tile to permanent fixtures, built-in furniture, cabinets, pipes, outlets and permanent columns, wall, and partitions using tile cutting procedures recommended by tile manufacturer.

2. Maintain reference markers indicated on subfloor for future cutting, by repeating on finished terrazzo tile floor.
3. Lay tile from center marks established with principal walls discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less than one half tile at perimeters. Lay tile square to room axis, unless otherwise indicated.
4. Adhere tile flooring to substrate using full spread of adhesive.
5. Lay tile using conventional procedures for laying resilient tile, placing tile carefully and firmly in position and as level as possible. Provide uniform grout joints of 1/8".
6. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged, if cartons are so numbered. Do not install broken, cracked or chipped tiles.
7. Roll and cross roll floor with 150 pound sectional roller continuously while tile is being laid. Use hand roller in areas that cannot be reached with large roller. Cease rolling when rolling has no more effect.
8. Allow adhesive to cure for manufacturer's recommended time.
9. Grout all joints. Apply grout in accordance with manufacturer's recommendations and requirements.
10. Do not subject floors to traffic until adhesive is dry and hard and sealers and finishes are applied.
11. Remove and replace tiles that are not flat, including lipped, cupped, curved, or poorly adhered tile. Remove rejected tile from site.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide on-site services of tile manufacturer or authorized distributor for technical assistance during preparation and installation.

3.5 SEALING AND FINISH

A. Remove any excess adhesive and thouroughly clean floor.
   1. Apply 2 coats of manufacturer's sealer in accordance with manufacturer's requirements.
   2. Allow sealer to dry.
   3. Apply 2 coats of manufacturer's sealer/finish in accordance with manufacturer's requirements.

3.6 CLEANING AND PROTECTION

A. Remove excess adhesives, dirt, stain and other foreign material. Clean floors in accordance with tile manufacturer's instructions.

B. Protect finished installation at all times. Repair or replace flooring damaged prior to final acceptance of installation by Owner.

END OF SECTION

SECTION 09 6725
EPOXY RESIN FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Decorative monolithic epoxy-resin kitchen flooring.
   2. Integral cove base.

1.3 SUBMITTALS

A. Product Data: For each type of product specified. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors, textures, and patterns available for each resinous flooring system indicated.

C. Samples for Verification: Of each resinous flooring system required, 6 inches (150 mm) square, applied by Installer for this Project to a rigid backing, in color, texture, and finish indicated. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Material Certificates: Signed by manufacturers certifying that materials furnished comply with requirements.

F. Maintenance Data: For resinous flooring to include in the maintenance manuals specified in Division 1.

1.4 PROPERTIES

Test	Specification	Requirement
Compressive Strength	ASTM-C579	13,500 p.s.i.
Tensile Strength	ASTM-C307 .	1,790 p.s.i.
Flexural Strength	ASTM C 580	
Water Absorption	ASTM-C413	0.37% (NIL)
Thermal Coefficient of Expansion	ASTM-C531.	1.9x10 (-5) in./in. Deg F
Resistance to Impact (concrete)	MIL -D3134 Maximum	10 Mils
Indentation Characteristics	MIL-PRF-3134,	Not more than 5%
Flexural Modulus of Elasticity	ASTM C-580	7.03 x 10(6)
Water Absorption	ASTM C-413	0.37NIL
Antimicrobial Resistance	ASTM G21	Passes
Flammability	ASTM D635	Self-Extinguishing
Thermal Shock 5 cycles	ASTM C-884	No cracking, crazing, warping, scaling or flaking

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who has specialized in installing resinous flooring similar in material, design, and extent to that indicated for this Project and who is acceptable and is certified, in writing, to resinous flooring manufacturer.
   1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to install resinous flooring systems specified.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, and sealing or finish coats, through one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

C. Field Samples: On floor area selected by Architect, provide full-thickness resinous flooring system samples that are at least 48 inches square to demonstrate texture, color, thickness, chemical resistance, cleanability, and other features of each resinous flooring system required. Simulate finished lighting conditions for review of in-place field samples.
   1. If field samples are unacceptable, make adjustments to comply with requirements and apply additional samples until field samples are approved.
   2. After field samples are approved, these surfaces will be used to evaluate resinous flooring.
   3. Obtain Architect's approval of field samples before applying resinous flooring.
   4. Final approval of colors will be from field samples, not samples submitted for verification.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.

B. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Resinous Flooring Schedule at the end of Part 3.

2.2 MATERIALS

A. Resinous Flooring: Resinous floor surfacing system consisting of primer; body coat(s) including resin, hardener, aggregates, and colorants, if any; and sealing or finish coat(s). Comply with requirements indicated in the Resinous Flooring Schedule.
   1. Reinforcing Membrane: Manufacturer's flexible resin recommended for crack isolation to help prevent substrate cracks from reflecting through resinous flooring.
      a. Provide fiberglass scrim embedded in reinforcing membrane.

B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

C. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

D. Waterproofing Membrane: Type recommended or produced by manufacturer of epoxy resin composition flooring system for type of service and floor condition indicated.

E. Anti Microbial Additive: Incorporate antimicrobial chemical additive to control growth of most algae, bacteria, fungi, mildew and mold.

F. Moisture Mitigation System: Concrete, especially slab on grade should be tested in accordance with ASTM F1869. If pounds exceed flooring limit remedial action must be taken.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where decorative quartz epoxy flooring 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 by the Contractor in a manner acceptable to the Architect

3.2 PREPARATION

A. General: Prepare and clean substrate according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral substrate for resinous flooring application.

B. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.3 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate and optimum undercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

B. Apply epoxy primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply reinforcing membrane to substrate cracks.

D. Apply self-leveling epoxy slurry body coat(s) in thickness indicated.

E. Broadcast Coats: Apply liberal application of clear epoxy resin mixture, allow to self level, broadcast (by hand or spray machine) ceramic coated quartz aggregate, allow to set to hardness, sweep off excess unbonded aggregate and repeat process to achieve total nominal thickness of 1/16" 1/8".

F. Integral Cove Base: Apply cove base mix to wall surfaces at locations indicated. Round internal and external corners. Install cove base according to manufacturer's written instructions and details including taping, mixing, priming, troweling, sanding, and topcoating of cove base.

G. Finish or Sealing Coats: After quartz filled broadcast coats have cured sufficiently, apply finish coats of type recommended by flooring manufacturer to produce a slip resistant finish matching approved submittal sample and in number of coats and spreading rates recommended by manufacturer.

1. Finished floor shall be 1/8" thick, uniform in color and free of trowel marks

3.4 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any number of times during flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified and sealed, and certified in presence of Contractor.
2. If test results show installed materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.5 CURING, CLEANING AND PROTECTING

A. Cure decorative quartz epoxy 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 resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

C. Clean resinous flooring not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each Project area. Use cleaning materials and procedures recommended in writing by resinous flooring manufacturer.

3.6 RESINOUS FLOORING SCHEDULE(See drawings Finish Schedule)

A. Epoxy Resinous Flooring : Provide resinous flooring system complying with the following:
   1. Products: Provide the following, or approved equal:
      a. Palma, Inc, PalmaLite Novalac 185 - Heat and corrosion resistant colored quartz epoxy.
   2. Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns produced for resinous flooring complying with requirements indicated.
   3. System Thickness: 3/16 inch.
      a. Primer-membrane coat.
      b. Body coat
      c. Top Coat, slip resistant, two coats.
   4. Wearing Surface: Antislip
   5. Base: 6 inch high integral cove base.
   6. Color: Pre-Blended Standard Colors as indicated on Finish Schedule.
   7. Components: Provide manufacturer's standard components complying with requirements, unless otherwise indicated. Provide the following additional components:
      a. Epoxy Primer.
      b. Reinforcing membrane if required over existing surface cracks.
      c. Body Coat.
      d. Chemical-resistant sealing or finish coat(s)
   8. Substitutions: See Section 01 2500 - Substitution Procedures.

END OF SECTION

SECTION 09 7700
PLASTIC LAMINATE WALL SURFACES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-manufactured panel system including mounting hardware and specified accessories.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry; furring, blocking, and other carpentry work that is not exposed to view.

B. Section 09260 - Gypsum Board Assemblies; for metal support systems not included in this section.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   1. Class 1/A - Flame Spread 0-25, Smoke Developed 450 or less.

B. Architectural Woodwork Institute (AWI) Quality Standards.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 3000.

B. Product Data: Manufacturer's Safety Data Sheets (MSDS) 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: Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with adjacent work. Include all wall elevations affected.

D. Color Selection Samples: Provide each color as indicated in the Finish Schedule.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Firm experienced in successful production of wall systems similar to that indicated for the Project, with sufficient production capacity to produce required units without causing delay in the work.
   2. Provide certificate signed by panel manufacturer certifying that products comply with specified requirements.

B. Installer Qualifications: Demonstrate successful experience in installing architectural woodwork similar in type and quality to those required for this project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver wall system until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate wall system have been completed in installation areas as specified by AWI 1700-G-3.

B. If panels are stored prior to installation, store them flat in completely enclosed areas, out of the weather. If panels must be stored in other than installation areas, store only in areas where environmental conditions comply with manufacturers recommendations. Do not expose panels to continuous direct sunlight, nor to extremes in temperature and humidity. Store products in manufacturer's packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Do not deliver or install wall system 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 as specified by AWI 1700-G-3.

B. Do not install wall system until normal lighting conditions exist. Normal lighting conditions are described as those in place when the project is finished. This includes, but not limited to, design lighting (wall washers, spot lights and flood lights, and similar fixtures) and natural lighting.

C. Wall, ceilings, floors, and openings must be level, plumb, straight, in-line and square as specified by AWI 1700-G-3.

D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Panels shall be conditioned in the environment in which they will be installed for a minimum of 72 hours prior to installation. The recommended environment is 75 degrees F (24 degrees C) and 45 percent relative humidity.

E. Environmental Conditions: Comply with Woodwork Manufacturer's recommendations for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

1.8 WARRANTY

A. Manufacturer warrants any product it has manufactured and sold against defects in materials or workmanship for a period of five years from the date of original purchase and acceptance for use. This warranty extends to products assembled / installed and used in the manner intended and does not cover damage or failure caused by: misuse, abuse or accidents, exposure to extreme temperature, improper installation, improper maintenance and exposure to water or excessive humidity or excessive moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Panel Specialists, Inc.; 3115 Range Rd., Temple, TX 76504. ASD. Toll Free Tel: (800) 947-9422. Tel: (254) 774-9800. Fax: (254) 774-7222. Email: psiwalls@panelspec.com. <mailto:psiwalls@panelspec.com> Web: <http://www.panelspec.com>

B. Requests for substitutions will be considered in accordance with provisions of Section 01 6000.

2.2 PANEL SYSTEMS

A. Provide prefinished decorative panels where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

B. Comply with applicable requirements of "Architectural Woodwork Quality Standards" in the production and installation of the wall panel system as published by the Architectural Woodwork Institute (AWl) unless otherwise indicated.

C. Panel System: #312 as manufactured by Panel Specialists, Inc. A progressive panel system with an exposed ½ inch (12mm) recessed horizontal channel reveal and a 1/2 inch (12mm) vertical divider molding creating a horizontal and vertical reveal between edge banded panels. Recommended for vertical and horizontal interior installations. Maximum panel length for horizontal installations is 96 inches (2438 mm).

1. Panel Thickness: 7/16 inches (11.1 mm).
2. Colors: See Finish Schedule
3. Horizontal Reveal: System to provide a recessed channel reveal of ½ inch (12mm) between panels.
4. Vertical Reveal: System to provide a 1/2 inch (1.5mm) reveal between panels.
5. Panel Finish: Refer to Room Finish Schedule and drawings.
6. Main Laminated Panel Fire Rating:
   a. Fire Rating: ASTM E84, Class A.
7. Panel Dimensions: Refer to drawings.

8. Molding: Provide manufacturer's accessories.
    a. #312 Horizontal Divider Molding
    b. #302A Vertical Divider Molding
    c. (#103-90, 103-90F) 90°Outside Corner Molding (1" rounded)
    d. (#103-135F & 103-135B) 135°Outside Corner Molding
    e. #304-90 End Cap for top and bottom of 90° outside corner molding
    f. #304-135 End Cap for top and bottom of 135° outside corner molding
    g. #304 Edge Trim Molding
    h. #304A Edge Trim Molding (2-piece)
9. Finishes:
    a. Panel Face:
        a) 1. Finish #1: Plastic Laminate
    b. Panel Face Pattern Direction:
        a) 1. Horizontal
    c. Aluminum Molding Finish:
        a) 1. Clear Anodize

2.3 MATERIALS

A. High Pressure Decorative Laminates (VGS,VGP,VGF & HGS) and non-decorative backers (BKV) used to surface wall panels systems shall be manufactured to meet or exceed the National Electrical Manufacturing Association (NEMA LD3-2005) for thickness, performance properties and appearance.

B. Medium Density Fiberboard (MDF): 45# density shall be used in Class III panel composition. Fire-rated MDF shall be used for Class I and Class II panel compositions (refer to AWI Section 200)

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared according to AWI 1700-G-3.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 FIELD DIMENSIONS

A. Where wall system is indicated to be fitted to other construction, check actual dimensions of other constructions by accurate field measurements before manufacturing wall system; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

B. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with manufacture of wall system without field measurements coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

3.3 PREPARATION

A. Panels must be acclimated to ambient temperature and humidity conditions in accordance with manufacturer’s specifications prior to installation. Refer to PSI installation guide for proper, handling, storage and acclimation procedures.

B. Clean surfaces thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

D. Prepare existing wall by removing all items. Grind and projections on wall to provide substrate within specified tolerances.

3.4 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Field cutting of all wall systems should be accomplished using carbide tools. All face penetrations and cutouts should have a minimal 1/8 inch (3 mm) radius in corners according to NEMA Standards Publication LD 3-2005.

C. All wall systems should receive an "S" bead of panel mastic on the back of the panel during installation.

D. Fasten all trim pieces and supports to existing concrete block with appropriate fasteners, Tapcon or similar.

E. For vertical applications, wall systems shall be mechanically fastened to horizontal metal furring strapping spaced 24 inches (610 mm) O.C. Furring straps shall be no less than 18-ga 3-1/2 inches (89 mm) wide, continuously. Metal strapping to be installed to the drywall studs prior to the application of the gypsum board by the framing contractor.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
2. Elevator pit ladders.
3. Steel doors and frames.
4. Exposed steel trusses, metal deck, steel beams, columns ans miscellaneous structural steel.
5. Concrete.
6. Concrete masonry units (CMU), concrete block.
7. Gypsum Board/Plaster walls, soffits, and ceilings.
8. Metal stair and railings.
9. Metal trim and specialty items
10. Exposed surfaces of steel lintels and ledge angles.
11. Mechanical and Electrical:
    a. In finished areas, including gymnasium, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
    b. In finished areas, paint shop-primed items.
    c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    d. On the roof and outdoors, paint all new, equipment, and dunnage that is exposed to weather or to view, including that which is not factory finished.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
6. Marble, granite, slate, and other natural stones.
7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete and cast stone.
10. Glass.
11. Acoustical materials, unless specifically indicated.
12. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 1200 - Structural Steel Framing.

C. Section 05 2100 - Steel Joist Framing.

D. Section 05 3000 - Metal Deck.

E. Section 05 5000 - Metal Fabrications: Shop-primed items.

F. Section 05 5100 - Metal Stairs: Shop-primed items.

G. Section 09 9113 - Exterior Painting.

H. Section 22 0480 - Tags, Charts And Identification: Color coding scheme for items to be painted under this section.

I. Section 23 0480 - General Labeling, Valve Charts And Piping Identification: Color coding scheme for items to be painted under this section.

J. Section 26 0550 - General Labeling And Identification: Color coding scheme for items to be painted under this section.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.5 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

G. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).

H. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Brewster Central School District's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 10 years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.8 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 4 feet (1.21 m) long by 4 feet (1.21 m) wide, illustrating paint color, texture, and finish.

C. Provide door and frame assembly illustrating paint color, texture, and finish.

D. Locate where directed by Architect.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.10 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions. Refer to Section 01 2500 - Substitution Procedures for additional requirements.

B. Paints:
   1. Base Manufacturer: Benjamin Moore & Co: www.benjaminmoore.com..

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: 01 2500 - Substitution Procedures.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   5. Supply each paint material in quantity required to complete entire project's work from a single production run.
   6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 PAINT SYSTEMS - INTERIOR

A. All Interior surfaces indicated to be painted, unless otherwise indicated; Including gypsum board, concrete masonry and shop primed steel.
   1. Two top coats and one coat primer for new surfaces.
   2. One top coat and one coat primer for existing surfaces.
   3. Primer(s): As recommended by manufacturer of top coats.

B. Concrete/Masonry, Opaque, Latex, 3coat: (New surfaces)
   1. One coat of block filler. Super Craft No. 285
   2. Semi-gloss: Two coats of latex enamel. Super spec Moore: # 276

C. Concrete/Masonry, Opaque, Latex, 2 coat: (Existing surfaces)
   1. One coat of latex primer sealer. Fresh Start All purpose primer. (# 046)
   2. Semi-gloss: One coat of latex enamel. Super spec Moore: # 276

D. Ferrous metals, not primed, Acrylic Latex, 3 coat:
   1. One Coat latex primer.
   2. Semi-gloss: 2 coats of Super Spec HP DTM Acrylic (P29),
   3. or 2 coats of Super Spec Interior Latex (276)

E. Ferrous metals, primed, Acrylic Latex, 2 coat:
   1. Touch up with latex primer.
   2. Semi-gloss: 2 coats of Super Spec HP DTM Acrylic (P29),
   3. or 2 coats of Super Spec Interior Latex (276)

F. Gypsum Board/Plaster, Latex, 3 coat: (New Surfaces)

1. One coat of Moore Super Spec Latex Enamel Undercoater & Primer Sealer.(253)
2. Semi-Gloss: 2 coats of Latex Enamel; Moore Super Spec Interior Latex (276)

G. Gypsum Board/Plaster, Latex, 2 coat: (Existing Surfaces)
1. One coat of Alkyd Primer sealer, Moore Super Spec Latex Enamel Undercoater & Primer Sealer.(253)
2. Semi-Gloss: 1 coats of Latex Enamel; Moore Super Spec Interior Latex (276)
3. Eggshell: 1 coats of Latex Enamel; Moore Super Spec Interior Latex # C274

H. Concrete Floor Surface, Urethane modified alkyd resin, 1 coat (Existing surfaces)
1. High Gloss: 1 coat of Moore Porch & Floor Enamel, # C112.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Clean concrete according to ASTM D4258. Allow to dry.
3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

G. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by top coat manufacturer.

H. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

J. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

K. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

L. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and SSPC-SP 3. Protect from corrosion until coated.

M. Cleaning Existing Walls: Remove all loose paint, plaster and other coatings.
1. Working from bottom to top, apply prepared cleaning solution to a dry surface.
2. Leave solution on the surface for 5-20 minutes. If solution begins to dry, reapply.
3. Gently scrub heavily soiled areas.
4. Rinse thoroughly with clean water with by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip.
5. Apply after wash. Let the Afterwash stay on the surface for three to five minutes.
6. Pressure rinse from the bottom of the treated area to the top.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9300
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of stains and transparent finishes.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category.
   2. MPI product number (e.g. MPI #33).
   3. Manufacturer's installation instructions.

C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 18" x 18" in size.

D. Certification: By manufacturer that stains and transparent finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Materials: Furnish the following for Brewster Central School District's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Stain and Transparent Finish Materials: 1 gallon (4 L) of each color and type; from the same product run, store where directed.
   3. Label each container with color and type in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum ten (10) years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five (5) years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperature: 50 degrees F (10 degrees C) unless required otherwise by manufacturer's instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide finishes used in any individual system from the same manufacturer; no exceptions.

B. Transparent Finishes:
   1. PPG Paints Deft Interior Clears/Polyurethanes: www.ppgpaints.com.
   2. Sherwin-Williams Company: www.sherwin-williams.com.

C. Stains:
   1. PPG Paints Deft Interior Stains: www.ppgpaints.com.
   2. Sherwin-Williams Company: www.sherwin-williams.com.

D. Substitutions: .See Section 01 2500 Substitution Procedures

2.2 STAINS AND TRANSPARENT FINISHES GENERAL

A. Finishes:
   1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each finish material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect.

E. Colors: Color to match Plastic Laminate Wall Panel. See finish schedule.

2.3 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood - As indicated on drawings.:
   1. Three (3) coat(s) varnish over One (1) coat(s) stain.

2. Stain: Semi-Transparent Stain for Wood, Water Based; MPI #186.
   a. Products:
      a) PPG Paints Deft Interior Water-Based Wood Stain, DFT300 Series. (MPI #186)
      b) Substitutions: See Section 01 2500 Substitution Procedures
3. Top Coat(s): Polyurethane Varnish, Oil Modified.
   a. Products:
      a) PPG Paints Deft Interior Polyurethane Oil-Based Satin 350, DFT129.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION

SECTION 10 1100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Markerboards and Tackboards.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 09 2116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.4 REFERENCE STANDARDS

A. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a (Reapproved 2016).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

D. Samples: Color charts for selection of color and texture of chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, and trim.

E. Manufacturer's printed installation instructions.

F. Maintenance Data: Include data on regular cleaning, stain removal .

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: 50 years from date of Substantial Completion

PART 2 PRODUCTS

2.1 MANUFACTURERS

2.2 VISUAL DISPLAY UNITS

A. Markerboards: Porcelain enamel on steel, laminated to core.

1. Color: White.
2. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch (0.61 mm).
3. Core: fibreboard, particle board or MDF, 7/16 inch (1.09 mm) thick, laminated to face sheet.

4. Backing: 32 gage Galvanized steel sheet, laminated to core.
5. Size: As indicated on drawings.
6. Frame: Extruded aluminum, with concealed fasteners.
7. Frame Profile: As indicated on drawings.
8. Frame Finish: Anodized, natural.
9. Accessories: Provide:
    a. Aluminum chalktray for each markerboard.
    b. Map Rail: Furnish map rail at top of each unit, complete with the following accessories:
        a) Display Rail: Provide continuous cork display rail, 2 inches (50 mm) wide integral with map rail.
        b) End Stops: Provide one end stop at each end of map rail.
        c) Map Hooks: Provide 2 map hooks for every 48 inches of map rail or fraction thereof.
        d) Flag Holder: Provide one flag holder for each room

B. Vinyl Fabric laminated to fiberboard.
1. Cork Thickness: 7/16 inch (1.09 mm).
2. Fabric: Vinyl coated fabric.
3. Color: As selected from manufacturer's full range.
4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
5. Size: As indicated on drawings.
6. Frame: Same type and finish as for markerboard.
    a. Frame Profile: Same type as for fixed markerboard
    b. Frame Finish: Same finish as for fixed markerboard.

C. Tackboards: Forbo Bulletin Board laminated to particleboard.
1. Cork Thickness: 5/8 inch.
2. Cork Material: Forbo Bulletin Board.
3. Color: As selected from manufacturer's full range.
4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 <https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20E84>.
5. Size: As indicated on drawings.
6. Frame: Same type and finish as for fixed markerboard - for public spaces
7. Frame Finish: Anodized, natural.
8. **Forbo material to align flush with the leading edge of aluminum perimeter trim – FINAL INSTALLATION TO BE SEAMLESS WITH NO INTERMEDIATE ALUMINUM TRIMS**
9. **Use for all Public Spaces.**

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.2 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

D. Surfaces to be covered must be clean, smooth, dry, uniform in color and structurally sound.
   1. covered must be clean, smooth, dry, uniform in color and structurally sound.

E. Wall Covering: in accordance with manufacturer's instructions.
   1. Clean ballpoint pen ink, wax crayon, ink marker, oil-based stains, or any foreign matter that may bleed through wall covering and prime with a stain blocking primer/sealer.
   2. Remove any substrate mildew with a chlorine bleach solution, rinse, and allow to dry before installing. Wash greasy walls with an ammonia solution, rinse, and allow to dry before installing.
   3. overlap the edges at least 2”, double cut all seams.
   4. Vertical joints should not occur less than 6” from the outside and inside corners

3.3 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Room and Corridor Door signs.

B. Interior Directional and Informational signs.

C. Emergency evacuation maps.

D. B**ronze** Plaque.

1.3 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls for temporary Project identification signs and for temporary information and directional signs

B. Section 01 5813 - Temporary Project Signage.

C. Section 04 2000 - Unit Masonry: For signage on fire walls above finished ceilings.

D. Section 09 2116 - Gypsum Board Assemblies: For signage on fire walls above finished ceilings.

E. Section 14 2100 - Electric Traction Elevators: Modernization for code-required elevator signage.

1.4 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. Submit for approval by Brewster Central School District through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Verification Samples: Submit samples showing colors specified.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of metal or polymer finishes beyond normal weathering.
      b. Deterioration of embedded graphic image colors and sign lamination.
   2. Warranty Period: 5 years years from date of Substantial Completion

PART 2 PRODUCTS

2.1 PANEL SIGN

A. Manufacturers
   1. Flat Signs:
      a. Crown Signs, 4 Executive Plaza, Yonkers, NY 10701; (914) 375-2118.
   2. Substitutions: Section 01 2500 Substitution Procedures.

B. Manufacturer’s standard monolithic tactile plaque constructed utilizing a thermoforming process, which provides a fully homogeneous plaque sign. The sign body, face, raised text and Braille are compression molded to form a single dimensional component that results in a sign surface that exhibits a toughness that resists scratching, cracking, gouging and graffiti.
   1. Style: Identification: Photopolymer Signs with raised lettering is physically attached, not laminated to the face plate.
      a. Sign to be satin Braille and pictograms raised. "Tipping" shall be provided where just the tips or the raised areas are finished providing an extra layer of protection to the sign and paint.
      b. Provide VHB Tape, holes drilled/countersunk for mounting,, back plates, and window areas for paper inserts.
   2. Material: Extruded Engineered PVC/Acrylic alloy with Integral background colors and high impact resistance with Class A Fire Rating.
   3. Sign Thickness: 1/8 inch (3mm).
   4. Lettering/ Tactile Characters/Symbols: Integral Raised 1/32 inch (1 mm) from sign plate face
   5. Lettering Style: Typeface as selected from the manufacturer’s standard sans serf or simple serf typefaces, upper case letters, as indicated on drawings.
   6. Braille: Grade 2 braille, placed directly below last line of letters or numbers
   7. Contrast: Letters, numbers and symbols shall contrast with background.
      a. Provide three standard colors
   8. Milled slot with lexan cover for paper insert where indicated.
   9. Edge Treatment:
      a. Profiles: Standard 0.5" Radiused Corner
   10. Color of Background: As selected from manufacturer’s standard background colors to match existing.
   11. Color of Text and Raised Characters: As selected from standard colors to match existing.
   12. Surface Texture: Matte

C. Interior: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:
   1. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
      a. Raised copy color - Identification letters require second color, to be selected by Architect.

b. Provide name slots as indicated.

2. Fasteners: Use fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
   a. All fastener shall one way security torx head type.
3. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for installations as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work
4. Substitutions: Section 01 2500 Substitution Procedures.
5. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for installations as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work

D. Plaques:
   1. Artistic Bronze, Ocala, FL.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.

B. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.

C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.

D. Brass Castings: ASTM B 584, Alloy UNS No. C85200 (high-copper yellow brass).

E. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
   1. Plastic (self-extinguishing material) engraving stock with face and core piles in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standard.

2.3 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
   1. Flame Spread: Less than 25.
   2. Smoke Development: Less than 450

B. Room and Door Signs: Refer to schedule on drawings.
   1. Character Height: As shown on drawings.
   2. Sign Height: As shown on drawings.
   3. Total Frame depth: 3/8 inch.
   4. Name slot height: 7/8 inch.
   5. Classroom and Office Doors: Identify with As shown on drawings.; in addition, provide "window" section for replaceable occupant name.
   6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
   7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   8. Rest Rooms: Identify with pictograms, the names as shown on drawings and braille.

C. Interior Directional and Informational Signs:
   1. Sign Type: Same as room and door signs.
   2. Sizes: As indicated on drawings.
   3. Wording of signs is indicated on drawings.
   4. Where suspended, ceiling mounted, or projecting from wall signs are indicated, provide two-sided signs with same information on both sides.

D. Provide for locations and rooms to be determined later, an additional:
   1. Ten (10) type 'A' signs;
   2. Ten (10) type 'B' signs
   3. Ten (10) type 'D' signs for way finding to be determined at a later

E. Emergency Evacuation Maps:
   1. Allow for one map per elevator lobby.
   2. One (1) screen printed fire evacuation sign map per each classroom and entry door of occupied space opening into a corridor.
   3. Map content to be provided by Brewster Central School District. Identify location and direction to exits.

F. Plaque: Location as indicated on drawings.

2.4 SIGN TYPES

A. Flat Signs: Signage media in aluminum frame.
   1. Wall and Ceiling Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
   2. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.

B. Radius / Curved Signs: One-piece, curved extruded aluminum media holder securing flat, flexible sign media by curved lip on two sides; other two sides closed by end caps; concealed mounting attachment.
   1. Sizes: As indicated on drawings.
   2. Finish: Natural (clear) anodized.
   3. Wall Mounting of One-Sided Signs: Mechanical anchorage, with predrilled holes, and set in clear silicone sealant.
   4. Wall and Ceiling Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
   5. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.

C. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
   2. Character Case: Upper case only.
   3. Background Color: As selected by Architect.
   4. Character Color: As selected by Architect color.

2.5 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/8 inch (3 mm) exclusive of raised soppy.

B. Applied Character Panels: Acrylic plastic base, with applied acrylic plastic letters and braille.
   1. Total Backer Thickness: 1/16 inch (1.56 mm).
   2. Letter Thickness: 1/16 inch (1.56 mm).

3. Letter Edges: Square.

2.6 PLAQUES

A. Metal Plaques:
   1. Metal: Bronze casting.
   2. Size: As indicated on drawings.
   3. Border Style: As indicated on drawings.
   4. Background Texture: Matte.
   5. Mounting: As indicated on drawings.

2.7 ACCESSORIES

A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. All signs to be mechanically fastened and taped.

C. Install neatly, with horizontal edges level.

D. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2113
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Solid polymer toilet compartments. (HDPE Toilet Partitions and NFPA 286 certification)

B. Urinal screens. NFPA 286

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.4 REFERENCE STANDARDS

A. NFPA 286 certification

B. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials

1.5 PERFORMANCE REQUIREMENTS

A. HDPE Toilet Partitions and NFPA 286 certification

B. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with the ASTM E 84:

1. Smoke Developed Index: Not to exceed 450.
2. Flame Spread Index: Not to exceed 75.
3. Material Fire Ratings:
   a. National Fire Protection Association (NFPA): Class B
   b. International Code Council (ICC): Class B
4. Heat Sink: Aluminum heat sink to dissipate heat from incendiary devices used by vandals. Attached to bottom of all doors and panels.

1.6 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.

B. Installer’s Qualifications: A Company or Individual, regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.8 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Manufacturer’s guarantee.

1.9 WARRANTY

A. Manufacturer's guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Scranton Products, Hiny Hiders

2.2 PLASTIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE) resins, overhead braced. **(Floated HDPE is not acceptable.)**
   1. Color/Texture: Pebble Green.

B. Doors:
   1. Thickness: 1 inch (25 mm).
   2. Width: 24 inch (610 mm).
   3. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
   4. Height: 55 inch (1397 mm).

C. Panels:
   1. Thickness: 1 inch (25 mm).
   2. Height: 55 inch (1397 mm).

D. Pilasters: Pilasters shall be 81-1/2" high finished height. Pilasters shall include a mounting system comprised of a one piece 304 stainless steel with #4 finish 3" high shoe with an integral plate in the bottom. The shoe shall be mounted to the floor utilizing concrete anchors supplied by Global Partitions or equal. The concrete anchors shall be driven through the plate affixing it to the concrete floor. The concrete anchors shall have 2700lbs of holding strength when used in 5000psi concrete flooring. The pilaster height shall be adjusted by utilizing the machine thread bolt supplied which is placed into a metal insert installed in the bottom of the pilaster at the manufacturing facility.

E. Urinal Screens: To match compartments; mounted to wall with continuous Aluminum panel brackets .

2.3 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Manufacture's standard anodized aluminum rail with anti-grip profile.

C. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

D. Hardware: Satin stainless steel:
   1. Hinges: Heavy-duty 8" aluminum hinge shall have gravity-acting cam. Slide latch, strike/keeper and hinges are through bolted onto doors and pilasters using stainless steel, vandal-resistant through bolts. Keeper provides for emergency access into the stall by lifting up on the bottom of the door.
   2. Door Latch: Slide type with lift emergency access feature in strike keeper.
   3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   4. Coat hook with rubber bumper; one per compartment, mounted on door.
   5. Provide door pull for outswinging doors.
   6. **Provide door pull both sides of ADA compartments**.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

D. Start of work constitutes acceptance of job.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

F. All panels shall typically be mounted at 14" above finished floor

G. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.4 ADJUSTING/CLEANING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

D. Finished surfaces shall be cleaned after installation and be left free of all imperfections.

3.5 Protection

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. Remove factory protective coverings and clean finish surfaces in accordance with manufacturer's instructions before substantial completion.

END OF SECTION

SECTION 10 2213
WIRE MESH PARTITIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Wire mesh systems for walls.

B. Gates.

1.3 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Cylinders for locksets.

1.4 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

D. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for mesh materials, finishes, and hardware.

C. Shop Drawings: Indicate plan and vertical dimensions, elevations, component details; head, jamb, and sill details; location of hardware. Provide component details, anchorage, and type and location of fasteners.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five (5) years of documented experience.

B. Installer Qualifications: Experienced in installation of the work of this section with minimum of five (5) years..

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wire Mesh Partitions:

1. Acorn Wire and Iron Works, Inc: www.acornwire.com/#sle.

2.2 WIRE MESH PARTITIONS

A. Wire Mesh Partitions: Factory-fabricated modular assemblies of panels, doors, anchors, hardware, and accessories as required to provide a complete system.

1. Design Criteria:

a. Design partition system to provide for movement of components without damage, undue stress on fasteners or other detrimental effects, when subject to design loads.

b. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.3 COMPONETS

A. Woven Wire Mesh: Heavy duty.
1. Material: ASTM A510/A510M uncoated crimped steel wire.
2. Wire Size: 6 gauge, 0.192 inch (4.9 mm).
3. Mesh Opening Size: 2 inch (50 mm) diamond shape.
4. Mesh Weave: Plain weave, double crimped.

B. Framing and Support Members:
1. Material: ASTM A36/A36M steel shapes and ASTM A500/A500M cold-formed steel tubing.
2. Framing, Corner Posts, and Intermediate Support Members: Manufacturer's standard sizes for system specified and as indicated on drawings.
3. Vertical Stiffeners: As required for partitions greater than 144 inches (3658 mm) in height.

C. Doors: Same material as partitions, fully framed; manufacturer's standard construction and hardware for swing operation.
1. Hinged door fr ames 1-1/4” x 3/4” channel with 1-1/4” x 1/8” flat bar cover three sides, 1-3/8” x 3/4” x 1/8” angle riveted to lock side. Each door to have 1-1/2 pairs butt hinges riveted to both door and hinge bar
2. All bolts, hardware, and accessories for complete installation to be included
3. Locking: Mortise type cylinder locks operated by key outside, recessed knob inside
a. Lockset to be ND96HD RHO; Finish: 626; Schlage or equal. Permanent cylinder core will be provided by the Owner. Refer to Section 08 7100.

D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.4 FASTENERS

A. Bolts, Nuts and Washers: Hot dip galvanized.

B. Anchorage Devices: Provide power driven, powder actuated, and drilled expansion bolts.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, unobtrusively located, consistent with design of structure.

2.5 ACCESSORIES

A. Bracing: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

B. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

C. Floor and Ceiling Pilaster Shoe: Manufacturer's standard.

2.6 FABRICATION

A. Fit and assemble in largest practical sections for delivery to site, ready for installation.

B. Make exposed joints flush or tight.

C. Provide components required for anchorage to adjacent construction.

D. All partitions to terminate and anchored to at structure above.

2.7 FINISHES

A. Painted Finish: Manufacturer's standard powder coat finish.
1. Color: Black.

B. Galvanized Finish: In accordance with requirements of ASTM A123/A123M.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean substrate surfaces.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install items plumb and level, accurately fitted, free from distortion or defects.

C. Perform field welding in accordance with AWS D1.1/D1.1M.

D. After installation, touch-up field welds scratched or damaged surfaces with shop applied finish.

3.3 TOLERANCES

A. Maximum Variation From Plumb or Level: 1/4 inch (6 mm).

B. Maximum Misalignment From True Position: 1/4 inch (6 mm).

3.4 ADJUSTING

A. Adjust doors to achieve free movement.

3.5 CLEANING

A. Remove temporary protection to prefinished surfaces.

END OF SECTION

SECTION 10 2239
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening.

B. Top-supported operable panel partitions, horizontal opening, electrical operation.

C. Safe Path Systems Safety Device

1.2 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing

B. Section 06 1000 - Rough Carpentry: Wood blocking and track support shimming.

1.3 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

G. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).

H. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

I. NEMA MG 1 - Motors and Generators; 2017.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.

C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in New York, showing loads at points of attachment to the building structure.

D. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.

E. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

F. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.

G. Manufacturer's Instructions: Indicate special procedures.

H. Installer's qualification statement.

I. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.

D. The operable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Folding Panel Partitions - Horizontal Opening: (Basis of Design)
   1. Modernfold Inc.: www.modernfold.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING, MANUALLY AND MOTOR OPERATED

A. Manual Folding Panel Partitions: Center opening; paired panels; side stacking; manually operated partitions. See drawings for type and locations.
   1. Product:
      a. Acousti-Seal Legacy - Paired Panel: Manually operated paired panel operable partition.
   2. Panel Construction:
      a. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin. 11 lbs. sq.ft
      b. Panel skin shall be:
         a) Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction minimum:
         b) 52 STC
      c. Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors shall be:
         a) Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
      d. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.

e. Panel finish shall be:
   a) Reinforced vinyl with woven backing weighing not less than 20 ounces (567 grams) per lineal yard. Color as selected by Architect.

3. Sound Seals
   a. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic or aluminum astragals or astragals in only one panel edge are not acceptable.
   b. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
   c. Horizontal bottom floor seals shall be:
      a) Modernfold SM2 Bottom Seal. Manually activated seals providing nominal 2" (51mm) operating clearance with an operating range of + 0.50" (13mm) to -1.50" (38mm). Seal shall be operable from panel edge or face. Extended seal shall exert nominal 120 pounds (54 kg) downward force to the floor throughout operating range.

4. Suspension System
   a. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
   b. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
   c. Carriers: One all-steel trolley with steel tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.

B. Motor Operated Folding Panel Partitions: Center opening; paired panels; side stacking; motor operated and manually operated partitions. See drawings for type and locations.
   1. Product:
      a. Acousti-Seal® Legacy – Electric Partition (933E)
   2. Panel Construction
      a. Nominal 3-inch (76 mm) thick panels in manufacturer's standard 48-inch (1220 mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin. 11 lb. sq.ft
      b. Roll-formed 21-gage steel wrapping around the panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical rated.
      c. STC 52
   3. Panel Finishes
      a. Panel Face finish shall be:
      b. Reinforced heavy-duty vinyl with woven backing weighing not less than 30 ounces (850 g) per lineal yard. Color as selected by Architect
      c. Panel trim: No exposed panel trim required or allowed; seals and hardware to be of one color to be selected by Architect.
   4. Sound Seals
      a. Vertical Interlocking Sound Seals between panels: Roll-formed astragals, with reversible tongue and groove configuration in each panel edge, for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.

b. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

c. Horizontal Bottom Seals

a) Automatic operable seals providing nominal 2-inch (51 mm) operating clearance with an operating range of +1/2-inch (13 mm) to –1-1/2 inch (38 mm) which automatically drop as panels are positioned, without the need for tools or cranks.

5. Suspension System

a. Suspension Tracks: Minimum 7-gage, 0.18-inch (5 mm) roll-formed steel. Track shall be supported by adjustable steel hanger brackets connected to structural support by pairs of 1/2-inch (13 mm) diameter threaded rods. Brackets must support the load bearing surface of the track.

b. Exposed track soffit: Steel, removable for service and maintenance, attached to track bracket without exposed fasteners, and pre-painted off-white.

c. Carriers: All-steel trolleys with steel-tired ball bearing wheels.

d. Warranty period: Ten (10) years.

6.

C.

D. Operation:

1. Acousti-Seal Legacy – Electric Partition (933E): Series of continuously hinged flat panels, electrically operated, top supported with operable floor seals.
2. Final Closure :
3. 1. Side Jamb with overlapping trail panel.
4. 3. Side Seal with pocket door interface (Remote stack only).
5. Partition shall be operated by:

a. 1. Two push button control stations wired in series and located on opposite sides and opposite ends of the partition. Control stations shall be activated by key switch at stack end of partition.

6. Motor unit shall be reversible, continuous duty, and class A insulated. Motor unit shall have NEMA MG 1 service factor, high starting torque, thermal overload protection, and open/drip proof enclosure. Motor assembly shall have wiring compliant with NFPA 70, 24-volt controls, compliant with UL 508A, and speed of 28 feet/minute. The drive unit motor shall be equipped with outboard limit switches to prevent over-extension. A positive chain drive attached to the lead panel shall pull the partition across the opening. Cable, belt, or other friction type drives will not be accepted.
7. Electric motor shall be:

a. 208/230-volt, 3-phase, 1 HP, 4.5 FLA

8. Safety Features:
9. Product:
10. Safe Path® Life Safety System; 3500 Sunrise Hwy, Great River , NY 11739

a. Opening / Closing Modes:

a) User/operator 6-digit code is entered, recognized and accepted; arming actuator initiates the system, green status indicator [ARMED] will illuminate. System awaiting the second user/operator to choose direction mode and touch operation switch on the secondary unit.

NOTE:

The use of an authorized user at the primary code-control station in conjunction with an additional safety officer at the secondary key-control station provides a full view of the area during operation of the equipment.

Once the doors are either opened or closed to their limits the authorized user at the primary control may leave the station. The secondary control station selector switch must be turned to "off" position.

b. Primary Code-Control Station #1 prevents unattended operation of the equipment and shall be capable of integration of the following equipment:
   a) • Individual user code recognition accepts or denies access.
   b) • Built-in touch active sensor / one touch operation.
   c) • Program code over-ride activation / emergency operation.
   d) • Status indicators.
   e) • Complete circuit control board / microprocessor assembly.
   f) • Terminal strip of sufficient size for additional safety features.
   g) • Power supply capable of operating additional safety features.
   h) • Power transformers, 12 VDC relays, resistors and inter-wiring.
   i) • Interface compatibility with existing (120 VAC/12-24 VDC)
   j) power source.
   k) • Optical Sensor.

c. Secondary Key-Control Station #2 prevents unattended operation and shall provide the following:
   a) • Single and double-gang electrical box retrofit capability.
   b) • Built-in touch active sensor / one touch operation.
   c) • LED illuminated status indicators.
   d) • Authorized user key and three (3) position selector switch.
   e) • EXTEND – OFF – STACK
   f) • Wireless radio controlled capability/optional

d. ADDITIONAL SAFETY FEATURES
   a) Passive Infrared Detectors Safe Path model # SP-80 AM High Sensitivity (PIR) Device shall be wall mounted at 7ft-10ft AFF, self-monitoring circuit operating on 12 VDC input power and have integral anti-masking features capable of automatic (fail to safe) condition function optics. Optics shall be focused to provide detection corridor adjacent to the doors that assures reliable detection. Each Long-Range PIR Detector shall provide multiple zones of detection.
   b) The infrared safety system must be designed to work as an integral part of the operable partition system. While the partition is in operation a minimum of two (2) infrared sensors / one (1) on each side monitor of the partition run for movement and immediately disengages the motor upon the "safety zone" being interrupted. These infrared beams must span the entire length of the partition at both sides. The protective housing must be sheet metal so as to minimize dust collecting on the lens. Custom manufactured covers trapezoidal design shall prevent items from resting or hanging on the cover causing blockage.
   c) PIR guards shall be constructed of sheet metal with hi-temperature baked white enamel finish or an approved equal. Guard shall be independently fastened to the wall or ceiling with a least four approved fastening devices. NOTE: Open cage style wire-formed covers are specifically unacceptable.
   d) Wireless Secondary Control Station shall be capable of surface mounting on opposite side of partition or divider curtain run at any

location to provide full view during operation. Secondary control station shall be remotely controlled by primary control station microprocessor circuit board assembly. Secondary control station requires an authorized users key to select direction mode.

e) Touch and hold for operation. Function is identical to hard-wired installation and prevents unattended operation.

f) An additional two (2) pocket/stack area sensors Safe Path model #SP-40SS (PIR) shall be self-contained self monitoring circuit, anti-masking technology, operating on 12 VDC input power, operating on an adjustable timed circuit. Mount at each rear corner at 8 ft. AFF. Additional sensors will be installed as site conditions warrant. Each concealed stack area PIR Detector shall provide multiple wide angle zones of detection.

g) In the interest of partition maintenance proper operation and the greater potential for equipment damage, weight sensitive floor mats in the pocket or stack area/s are specifically unacceptable.

h) Photo-electric/point to point light beam sensors mounted below 8’ AFF are subject to abuse, provide inadequate protection zones and are specifically unacceptable.

i) Visual-Audible Alert shall automatically activate during equipment operation cycle. Horn-strobe devices shall be wall mounted at opposite sides of partition or divider curtain run. A minimum of two (2) and a maximum of four (4) devices can be hard wired and operate on 24 VDC each. Horn-strobe devices shall be ADA compliant and visual alert lens clear/without color.

j) Audio recording voice alert shall annunciate a message in any language prior to, and or, during operation of equipment. Audible message/s may be located within primary and secondary control stations. Adjustable timed circuits shall actuate audible warning instructions prior to equipment operation. Audible instructions shall clearly identify safe operating procedures repeating, during each equipment cycle mode. Audible messaging devices shall be capable of remote locations, such as concealed stack areas and any pre-determined appropriate areas for increased safety.

k) Sensing devices, which trigger and stop the operation of the equipment, may be incorporated into the microprocessor circuit control board assembly. Additional devices such as:

(a) Laser detection sensors.
(b) Active infrared detectors.
(c) Presence detection sensors.
(d) Photoelectric point-to-point light beams.
(e) Pressure sensitive floor mats.
(f) Pressure sensitive lead edge devices.
(g) Shall be incorporated into safety system as various site conditions permit.

l) Passive Infrared Detectors Safe Path model # SP-80 AM

e. CONSPICUOUS NOTICE

a) Provide and permanently install required warning signage at the immediate vicinity of each control station outlining safe operating

procedures.

• WARNING-

b) • Electrically powered partition
c) • Only appropriately trained staff may operate this partition.
d) • Control stations must be attended by staff members while
e) the partition is in motion
f) • Staff members must stand on opposite sides of partition
g) during stacking and extending procedure
h) • Students must stay away from partition while in motion.

(a) Warning signs shall be approved "caution" yellow with black text, and constructed of unbreakable polymer, professional in manufacture.

f. INSTALLATION AND WIRING

a) Vendor agrees to furnish and install all wiring of suitable size, and raceways from the nearest electrical load center.
b) Make the proper connections to all items.
c) Minimum size raceway from low voltage conductors shall be ½ inch. Minimum size raceway for power shall be ¾ inch.
d) Existing conduits may be used where allowed by code.
e) Flexible conduits may be used in concealed locations.
f) Metal moldings shall be utilized as desired.
g) All power wiring shall be:
THHN, minimum size #12.
Low voltage wiring shall be 22 gauge, twisted, unshielded, copper, vinyl insulated, UL listed.
h) Specified shielded intrinsic special wiring as required.
i) All equipment shall be installed in a fail-safe manner such that the failure of any safety device shall render the electrically operated partition inoperable until such device is repaired.
j) All work shall be performed in accordance with the latest edition of the National Electrical code and applicable local codes.
k) All control stations shall be located at a safe distance from partitions and divider curtains. User operators must never come in contract with any part of the equipment.
NOTE: Each user control station shall be located at a minimum of (78") from the electrically operated equipment.

l) Limit Switches: Automatic type, at both extremes of travel, to prevent over-travel.
m) Emergency Release: Mechanism to disengage motor drive system and permit manual operation.
n) Pocket Door Interlock: Mechanism to prevent operation of panels unless storage pocket doors are fully open.

E. Accessories:

1. Ceiling Closure: White enameled ceiling closure; aluminum jamb and head molding, fittings and attachments, and intermediate meeting posts.
2. Pocket Enclosures: Door, frame, and trim to match adjacent walls.
3. Acoustic Sealant: As recommended by partition manufacturer.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Fire Rated Gypsum Board: ASTM C1396/C1396M, Type X, UL rated; 1/2 inch (12.7 mm) thick, maximum practical length; ends square cut, square edges.

C. Vinyl Coated Fabric: ASTM F793/F793M, Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.

D. Acoustic Insulation:
   1. Type: As required for acoustic performance indicated.
   2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that required utilities are available, of the correct characteristics, in proper location, and ready for use.

C. Verify track supports are laterally braced and will permit track to be level within 1/4 inch (6.4 mm) of required position and parallel to the floor surface.

D. Verify floor flatness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.

E. Verify wall plumbness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.

3.2 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557 and drawing details.

B. Install electric operator, wiring, and controls. Locate control station(s) as indicated.

C. Fit and align partition assembly level and plumb.

D. Lubricate moving components.

E. Install acoustic sealant to achieve required acoustic performance.

F. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.

G. Install operable partitions and accessories after other finishing operations, including painting have been completed.

H. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.

I. Broken, cracked, chipped, deformed or unmatched panels are not acceptable

J. Coordinate electrical connections.

3.3 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.Partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, Adjust throughout entire operational range. Lubricate hardware and other moving parts.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C.

D. Adjust partition assembly to achieve lightproof seal.

E. PART 6 COMPLETION

F. 6.01 Upon Completion, successful vendor shall arrange for a demonstration on the safe

G. operating procedures of the system to be witnessed by the appropriate school
H. official/s.
I. !7
J. Section 10 Specialties
K. 6.02 Vendor will furnish the Superintendent of Building and Grounds with:
L. A. Two (2) sets of keys for the entire system and shall be issued to
M. authorized user operators only.
N. B. Administrator shall determine at any time after completion, additional
O. keys required for authorized user/operators.
P. C. Vendor will furnish the Superintendent of Building and Grounds with
Q. three (3) copies of manuals containing manufacturer’s instructions,
R. operating and maintenance data for all equipment installed on this
S. project.
T. D. Provide invitation link to appropriate school of facility administrator
U. for access to annual staff training webinar certification procedure.
V. 6.03 WARRANTY
W. A. All equipment and parts shall be warranted by the vendor to be free from
X. defects in
Y.

3.4 CLEANING

A. Clean finish surfaces and partition accessories.
B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and Installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.5 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation and maintenance procedures to Owner's representative.
B. Provide Operation and Maintenance Manual to Owner's representative

END OF SECTION

SECTION 10 2601
WALL AND CORNER GUARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Corner guards.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.

1.4 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

C. Samples: Submit two sections of bumper rail, 24 inch (600 mm) long, illustrating component design, configuration, color and finish.

D. Product test reports from a qualified independent testing laboratory showing compliance of each component with requirements indicated

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Installer qualifications: Engage an installer who has no less than 3 years experience in installation of systems similar in complexity to those required for this project

B. Manufacturer’s qualifications: Not less than 5 years experience in the production of specified products and a record of successful in-service performance.

C. Code compliance: Assemblies should conform to all applicable codes including New York State Building Code

D. Fire performance characteristics: Provide wall protection system components with UL label indicating that they are identical to those tested in accordance with ASTM E84 for Class 1 characteristics listed below:

1. Flame spread: 25 or less.
2. Smoke developed: 450 or less.

E. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.

F. Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D-1308

G. Single source responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.

1.7 DELIVERY, STORAGE AND HANDLING

A. Materials must be acclimated in an environment of 65°-75°F (18°-24°C) for at least 24 hours prior to beginning the installation.

B. Installation areas must be enclosed and weatherproofed before installation commences

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wall and Corner Guards:
   1. Construction Specialties, Inc: www.c-sgroup.com
      a. SFS Series, - 20 RN
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 COMPONENTS

A. Corner Guards - Flush Mounted:
   1. Material: High impact vinyl with full height extruded aluminum retainer.
   2. Fire Resistance: Where fire rating is specified for the wall in which the guard is mounted, provide assemblies that have been tested in accordance with ASTM E119 for the same rating as the wall.
   3. Width of Wings: 2 inches (51 mm).
   4. Corner: Radiused.
   5. Color: As selected from manufacturer's standard colors.
   6. Length: One piece.

2.3 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members only.

B. Position corner guard 4 inches (100 mm) above finished floor to 48 inches (1200 mm) high.

3.3 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch (6 mm).

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch (6 mm).

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Commercial toilet accessories.
   1. Grab bars.
   2. Mirror Units.
   3. Toilet Tissue Dispenser. (Provided by Owner Installed by Contractor).
   4. Liquid Soap Dispenser. (Provided by Owner Installed by Contractor).
   5. Paper Towel Dispenser. (Provided by Owner, installed by Contractor.)
   6. Electric hand/hair dryers.
   7. Partition Mounted Sanitary Napkin Disposal.
   8. Recessed Sanitary Napkin Disposal.
   9. Semi-Recess Napkin Vendor
   10. Under-lavatory pipe supply covers.
   11. Utilities shelf with broom holder.

1.3 RELATED REQUIREMENTS

A. Section 10 2113 - Plastic Toilet Compartments.

1.4 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 2009.

D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

G. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017.

H. ASTM C1036 - Standard Specification for Flat Glass; 2016.

I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

J. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

K. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

M. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.6 WARRANTY

A. Warranty: Contractor shall provide a warranty for two (2) years after the date of Substantial Completion of the Contractor’s work or designated portion thereof.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Commercial Toilet and Bath Accessories:
   1. Bobrick Washroom Equipment, Inc. www.bobrick.com.
   2. Substitutions: Refer to Section 01 2500 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:
   1. Truebro LavShield.
   2. Substitutions: Refer to Section 01 2500 - Product Requirements.

C. Electric Hand/Hair Dryers:
   1. Excel Dryer: www.exceldryer.com/#sle.
   2. Substitutions: . Refer to Section 01 2500 - Product Requirements

D. Provide products of each category type by single manufacturer.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide two keys for each accessory to Brewster Central School District; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2.4 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: (AC-5)
   1. Products:
      a. Provided by Owner Installed by Contractor

B. Paper Towel Dispenser: (AC-11)
   1. Products:
      a. Provided by Owner, install by GC..

C. Soap Dispenser: (AC-6) Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
   1. Products:
      a. Provided by Owner Installed by Contractor.

D. Mirrors: Stainless steel framed, (AC-4)
   1/4 inch (6 mm) thick tempered safety glass; ASTM C1048.
   1. Size: 18" x 30" .
   2. Mirror shall have a one-piece Type-304 stainless steel angle frame, 3/4" x 3/4" (19 x 19mm) with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror; corners shall be welded, ground, and polished smooth; all exposed surfaces shall have satin finish with vertical grain. Mirror shall be tempered glass. All edges shall be protected by plastic filler strips. Backs of all glass mirrors shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16" (5mm) thick polyethylene padding. Galvanized steel back shall have integral horizontal hanging brackets located at top for mounting on concealed rectangular wall hanger. Mirror shall be secured to wall hanger with concealed Phillips-head locking screws located in bottom of frame.
   3. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
   4. Products:
      a. Bobrick #B-2908.

E. Grab Bars: Stainless steel, peened surface. (AC-1, AC-2, AC-3. See drawings for locations.)
   1. 18-8, Type-304, 18-gauge (1.2mm) stainless steel tubing with satin-finish. 1-1/4" (32mm) outside diameter. Ends are heliarc welded to concealed mounting flanges. Clearance between the grab bar and wall is 1-1/2" (38mm).
   2. Concealed Mounting Flanges — 18-8, Type-304, 11-gauge (3.2mm) thick, stainless steel plate; end flanges 2" x 3-1/8" (50 x 80mm) with holes for attachment to wall. Intermediate flanges 2-5/8" x 3-1/8" (65 x 80mm) wide x 3-1/8" (80mm) diameter
   3. Snap Flange Covers — 18-8, Type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. 3-1/4" (85mm) diameter x 5/8" (16mm) deep. Each cover snaps over mounting flange to conceal mounting screws.
   4. Bobrick grab bars that provide 1-1/2" (38mm) clearance from wall can support loads in excess of 900 pounds (408kg) if properly installed. Other grab bar configurations can support loads in excess of 250 pounds (113kg) if properly installed, complying with accessible design (including ADAAG in the U.S.A.) for structural strength.
   5. **Safety Warning:** Grab bars are no stronger than the anchors and walls to which they are attached and, therefore, must be firmly secured in order to support the loads for which they are intended. To avoid potential injury, the Construction Manager shall verify anchors are secue and insure maintenance personnel are instructed to remove the grab bar from service if the grab bar is not adequately secured to wall or if there is any observed damage to the welds.
   6. Length and Configuration: As indicated on drawings.
   7. Products:

a. Bobrick B-5806 Series .
b. Substitutions: Refer to Section 01 2500 - Product Requirements .

F. Sanitary Napkin Disposal Unit:(AC-8)
Partition Mounted Sanitary Napkin Disposal, back-to-back partition mounting with adjustable flanges, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Cabinet — 18-8, Type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.
2. Flange (2) — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn and beveled, one-piece, seamless construction.
3. Door — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.
4. Disposal Panels (2) — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Bottom edges hemmed for safety. Secured to door and permanent panel with spring-loaded, full-length stainless steel piano-hinges. Equipped with international graphic symbols identifying sanitary napkin disposal.
5. Waste Receptacle — Leak-proof, rigid molded polyethylene. Removable for servicing. Capacity: 1.2-gal. (4.6-L).
6. Product: #B-354 manufactured by Bobrick.

G. Sanitary Napkin Disposal Unit: (AC-9)
Stainless steel, recessed, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Cabinet — 118-8, type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.
2. Flange — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn and beveled, one-piece, seamless construction.
3. Door — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge.
4. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.
5. Disposal Panel — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Bottom edge hemmed for safety. Secured to door with a spring-loaded, full-length stainless steel piano-hinge. Equipped with an international graphic symbol identifying sanitary napkin disposal
6. Waste Receptacle - Leak-proof, rigid molded polyethylene. Removable for servicing. Capacity: 1.2-gal. (4.6-L).
7. Products:
   a. Bobrick #B-353.

H. Semi-Recessed Napkin/Tampon Vendor: (AC-10)
1. Cabinet - 18-8, Type-304, 18-gauge (1.2mm) stainless steel. All-welded construction.
2. Flange - 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn, one-piece, seamless construction. Radius on corners and return edges complement corners and edges on door
3. Skirt - 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Radius on corners complement corners and edges of flange and door.
4. Door - 18-8, Type-304, 18-gauge (1.2mm) stainless steel with satin finish. Secured to cabinet with a concealed full-length stainless steel piano-hinge. Equipped with two tumbler locks keyed like other Bobrick washroom accessories. Door has no
5. stainless steel piano-hinge. Equipped with two tumbler locks keyed like other Bobrick washroom accessories. Door has no brand-name advertising for products dispensed. Graphic symbols identify products dispensed. Graphic symbols identify products dispensed and coin denomination.

6. Products:
    a. Bobrick ConturaSeries B-47064C Semi-Recessed Free no-coin operation.

2.5 UNDER-LAVATORY PIPE AND SUPPLYPROTECTIVE COVERS

A. Under-Lavatory Pipe and Supply Covers: (AC-ll)
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch (3.2 mm) Rigid stain resistant PVC.
    a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
    b. Flammability: UL-94 V-0 Rating.
    c. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.
5. Products:
    a. Lav-Shield manufactured by TRUBRO, Inc.. Model 2018-AS-L1
    b. Substitutions: Refer to Section 01 6000 - Product Requirements .

2.6 ELECTRIC HAND/HAIR DRYERS

A. Electric Hand Dryers: (AC-13)
Traditional fan-in-case type, with downward fixed nozzle.
1. High Efficiency Surface Mounted ADA Compliant Electric Hand Dryer
2. Operation: Automatic IR sensor-operated on and off.
3. Mounting: Surface mounted. ADA compliant
4. Cover: Heavy-duty, one piece formed 18 gage stainless steel satin finished on all exposed surfaces.
    a. Finish: Finish: Brushed Number 4 finish.
    b. Tamper-resistant screw attachment of cover to mounting plate.
5. . Control assembly is activated by an infrared optical sensor located next to the air outlet.
    a. The dryer shall operate as long as hands are under the air outlet. Control includes a speed and sound control mechanism, adjustable heat control with High, Medium, Low and Off settings and a filter sensor which is activated should the filter become clogged. There is a 35-second lockout feature if hands are not removed. Sensor equipped with externally visible Red LED light that can flash error codes to assist in troubleshooting.
6.
7. Nominal Size: 8- 29/32 inches wide by 13-11/16 inches high by 4 inches deep.
8. Weight: 10 pounds stainless cover.
9. Power Source: 110 - 120 Volts, 11.3 - 12.2 Amps, 50/60 Hz, 1240 - 1450 Watts.
10. Motor: Thermally protected, series commutated, through-flow discharge vacuum motor/blower (1/2 hp / high-30,000 rpm, low-20,000 rpm) which provides air velocity of up to 16,000 LFM (linear feet per minute) at the air outlet and 7,000 LFM at the hands (4 inches [102 mm] below the air outlet).
11. Heater: Nichrome wire element, mounted inside blower housing to be vandal resistant. Heater Safeguard: Automatic resetting thermostat to open when airflow is restricted and close when airflow is resumed.
12. All metal parts coated according to Underwriters Laboratories, Inc. requirements.
13. Mount at the heights indicated on drawings.
14. Warranty: Unit shall be warranted against defects in materials or workmanship for 5 years.
15. Electric Hand Dryer Products:

a. Acceptable Manufacturer: Excel Dryer Inc., : 357 Chestnut St. P. O. Box 365; East Longmeadow, MA 01028. ASD. Tel: 413-525-4531; Fax: 413-525-2853; Email: sales@exceldryer.com; Web: www.exceldryer.com
   a) Excel Dryer Inc; Model TA-SB : www.exceldryer.com.

b. Substitutions: Refer to Section 01 2500 - Product Requirements.

2.7 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: (AC-12)
0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch (6 mm) diameter.
   2. Hooks: Two, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
   3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   4. Length: 36 inches (900 mm).
   5. Products:
      a. B-#224 manufactured by Bobrick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As shown on drawings and required by accessibility regulations

3.4 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.
   1. Fire Rated in fire rated walls.

C. Accessories.

D. Knox Box

1.3 RELATED REQUIREMENTS

A. 04 2000 - Unit Masonry.

B. Section 05 5000 - Metal Fabrications. Steel lintels.

C. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

D. Section 09 2116 - Gypsum Board Assemblies.

1.4 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.5 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.7 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:
   1. Larsens's Manufacturing Co., 7421 Commerce Ln, Minneapolis, MN 55432, (800) 527-7367.
   2. Substitutions: Section 01 2500 Substitution Procedures.

B. Fire Extinguisher Cabinets and Accessories:
   1. Larsen's Manufacturing Co; -: www.larsensmfg.com.
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Refer to Part 3 for Fire Extinguisher Schedule..

2.3 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed stainless steel sheet; 0.036 inch (0.9 mm) thick base metal.

C. Fire Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall or outer and inner boxes with 5/8 inch (15.9 mm) thick fire barrier material.

D. Metal: Formed stainless steel sheet; 0.036 inch (0.9 mm) thick base metal.

E. Cabinet Configuration: Semi-recessed.
   1. Size to accommodate fire extinguishers and accessories.
   2. Projected Trim 2-1/2" with standard model flange width

F. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

G. Door Glazing: Plastic, clear, 1/8 inch (3 mm) thick acrylic bubble. Set in resilient channel gasket glazing.

H. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

I. Fabrication: Weld, fill, and grind components smooth.

J. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel. and Baked enamel in Science Rooms (fire /blanket cabinet combo unit)

K. Finish of Cabinet Interior: White colored enamel.

2.4 FIRE CABINET ALARM

A. High impact plastic is plunger activated .

B. Provide heavy-duty 9 volt battery.

C. Provide On/off jack for convenient servicing.

D. Provide in all cabinets installed in corridor and public spaces.

E. Product: Larsen's Vigilante Alarm. in corridors only, rooms to have no alarms.

2.5 HIGH SECURITY COMMERCIAL KEY BOX. .

A. Series 3200 “Knox-Box” as manufactured by Knox Co. complying with the following:
   1. Recessed mounted with hinged door.
   2. Housing: ¼” steel plate housing.
   3. Door: ½” thick steel with interior gasket seal.
   4. Lock: UL listed, double action rotating tumblers and hardened steel pins accessed by a biased cut key.
      a. Provide 1/8" dust cover with tamper seal.
   5. Polyester powder coat color as selected.

2.6 ACCESSORIES

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

B. Extinguisher Theft Alarm: Battery operated alarm, 10 second delay for disarming, activated by opening cabinet door.

C. Cabinet Signage: "FIRE EXTINGUISHER".

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, as indicated on drawings from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets and on wall brackets.

3.3 SCHEDULES

A. Fire Extinguishers
   1. Model MP10
      a. Capacity: 10 lbs
      b. Weight: 18 lbs
      c. Cylinder Diameter: 5”
      d. Height: 20”
      e. Width: 7-3/4”
      f. UL rating: 4A-80B: C
      g. Standard Bracket: 5525
      h. Location: in all areas except mechanical and electrical rooms.
   2. Model DC20
      a. Capacity: 20 lbs.
      b. Weight: 38 lbs
      c. Cylinder Diameter: 7”
      d. Height: 23-1/4”
      e. Width: 7-3/4”
      f. UL rating: 2A-C
      g. Standard Bracket: 1007
      h. Location: Mechanical and electrical rooms.

B. Fire Extinguisher Cabinets.
   1. Larson's Cameo Series FS C2409-6R semi recessed design suitable for fire extinguishers specified.
   2. Trim: 2-1/2" Rolled
   3. Acrylic Bubble.
   4. Finish: Stainless Steel #4 satin finish.
   5. Cabinet Alarm: Larsen's "Vigilante". Provide on each corridor cabinet.
   6. Bubble Construction: High impact plastic with white lettering.
   7. Plunger operated.
   8. On/Off service switch.

9. Include heavy duty 9 Volt battery

END OF SECTION

SECTION 10 5100
LOCKERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Metal lockers.

B. ADA Lockers: 5% of each locker types shall be ADA compliant. Location as selected by Owner..

C. Metal tops and filler panels.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base construction.

B. Section 06 1000 - Rough Carpentry: Wood blocking and nailers.

1.4 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan.

D. Full Size Sample: One full-size locker of each construction specified for evaluation of construction.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

F. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten (10) years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five (5) years of documented experience and approved by manufacturer for installation of units required for this Project.

1.7 MOCK-UP

A. Provide mock-up of one full size locker, each locker tier with sloped top, in selected colors.+

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

1.9 WARRANTY

A. Manufacturer shall warrant the lockers for twenty (20) years.

1. Warranty shall all include all defects in material and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Lockers:
   1. DeBourgh Athletic Lockers, "Rebel". 27505 Otero Avenue, La Junta, CO, 1 800 328 8829; sales@debourgh.com
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 LOCKER APPLICATIONS

A. Wardrobe Lockers: Two tier metal lockers, on concrete base.
   1. Width: 15 inches (375 mm).
   2. Depth: 15 inches (380 mm).
   3. Height: 72 inches (1,830 m). 2 tier system, (Total Locker hieght.)
   4. Fittings: 2 coat hooks.
   5. Single point latch
   6. Locking: Padlocks.
   7. Provide sloped top, factory welded and installed, where not recessed.
   8. Louver Perforated door top and bottom. Back and sides solid.
   9. Tier Dividers: Each locker shall be divided by a CRS, securely welded on all four (4) sides to combine with tops, bottom and sides.

2.3 METAL LOCKERS

A. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; electrostatic powder coat finished inside and out.
   1. Where ends or sides are exposed, provide flush panel closures.
   2. Provide filler strips where indicated, securely attached to lockers.
   3. Color: To be selected by Architect

B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot MIG or TIG spot welded.
   1. Top: 16 gage, 0.051 inch (1.29 mm).
   2. Bottom: 16 gage, 0.051 inch (1.29 mm).
   3. Sides: 16 gage, 0.051 inch (1.29 mm).
   4. Back 16 gage, 0.051 inch (1.29 mm).
   5. Frame: 16 gage, 0.06 inch (1.29 mm).
   6. Door: 16 gage, 0.051 inch (1.29 mm).
   7. Door Stiffener: 16 gage, 0.051 inch (1.29 mm).
   8. Shelves: 16 gage, 0.06 inch (1.29 mm).
   9. Latch Hook: 12 gage, 0.081 inch (2.05 mm).
   10. Hinges: 16 gage, 0.051 inch (1.29 mm).
   11. Sloping Top: 16 gage, 0.051 inch (1.29 mm).

C. Bottom: The bottom is made from galvanized steel 0.30 (+/- 0.05) ounce per sf., sloped and perforated for drainage. The lateral and back flanges are bent 90 degrees downward and the front flange of the bottom is double layered to equal a 16 gauge thick lower frame. The front and is made with a sequence of 4 bends to create a full width door strike fitted with a riveted door bumper. The bottom is welded to the body.

D. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
   1. The frame steel strip bent three times 90 degrees. The corner joints are securely spot welded.

E. Door: Flush mounted door is made from a solid 16 gauge, single sheet of cold rolled steel with a double bend vertically on both sides and single bends horizontally at the top and bottom

F. Door Stiffener: The full height door stiffener, bent three times vertically and with a single bend at the top and bottom. The stiffener is spot welded to the inner side of the door panel and MIG welded to the hinged side of the door thus preventing distortion. Minimum 30% of door width.

G. Continuous Hinges: Full length 16 gauge steel piano hinge welded to door and frame. Weld door to frame 4" - 6" minimum.

H. Sloping Top: Top, sides and back 16 gauge, welded to sides and back and factory installed.

I. Back; The back is formed using a single sheet of 16 gauge steel and welded to the body. The back is assembled inside the flanges of the sides. The bottom edge is bent 90 degrees inward by no less of 3/4"

J. Sides: The rear ends of the 16 gauge sides are bent 90 degrees inward and welded to the back panel. The front ends are welded to the front frames and are offset to create an outside flush and smooth surface.

K. Shelf: The back and sides are bent 90 degrees downward and spot welding with the sides and back. The front side of the shelf is double flanged at 90 degree ended by a 180 degree flattening crease.

L. Latching: The latching mechanism shall be a finger lift control and constructed of 12 gauge steel encased in a nylon cover with a generous finger pull. The spring activated nylon slide latches are completely enclosed in the lock channel allowing the door to close even in a locked position. This latching system is designed for use with a padlocks. Stainless steel cup recessed into formed doors., Sentry II Gravity Latch.

M. Door Handle: The handle is made from steel. Finish: Stainless steel.

N. Bumpers: Two (2) 1/2" diameter polypropylene bumpers riveted to the top and bottom door strikes of the locker.

O. Coat Hooks: Lockers are equipped with at least three (3) single hooks such as one single hook in the centre back and two (2) single hooks in the centre of each side panel. Hooks are made with 1/2" x 1/8" rounded end flat bar zinc-plated. Securely spot-welded to the body.

P. Ventilation: Ventilation opening shall be diamond pattern perforation.

Q. Number Plates: Provide oval shaped brass plates. Form numbers 1/4" inch (- mm) high of block font style with ADA designation, in contrasting color.

R. Exposed ends: 16 gauge box end panels, formed to fit the height and depth of the locker, with a 1" edge dimension. The box panel will also conform to match the sloping tops. Double row box end panels shall have a "Z" reinforcing member. Panels to be installed to conceal all fasteners and painted to match the lockers.

1. Accessories For each double tier locker: One double prong wall hooks, steel, formed with ball points, zinc-plated and attached with two bolts or rivets.

S. Number Plates: Anodized aluminum are numbered with engraved numbers. Each plate is flush-fitted into the door and securely fixed with pop-rivets.

2.4 LOCKS

A. Fabricate lockers to receive the following locking devices, installed on lockers using security-type fasteners:

1. Pad lock hasps for all lockers.
2. Accessible Lockers Where lockers are to be accessible for the disabled, provide lockers, hooks and locking systems that comply with applicable regulations. .

2.5 METAL LOCKER FINISH

A. Steel sheets and strips shall be sufficiently clean and flat to avoid any detrimental effect to the appearance and construction of the lockers. The surface is suitably prepared for application of the paint coating.

1. Chemically pretreat metal with a six stage cleaning phosphatizing and metal preparation process. Finish coat shall be baked on at 350 to 400 degrees. Select colors from manufacturer's standard colors.

2. All components shall be finished with a 2mm hybrid epoxy/polyester powder, electrostatically applied to ensure uniform thickness and baked cure.

B. Finishes and proceedings are in accordance with CGSB-1-GP-12 specifications. Average thickness (five (5) readings per surface) of paint dry coating is at least 2-3 mil dry on all apparent surfaces. Not less than 0.2 mil dry on all other surfaces. Paint dry coating thickness reading is in accordance with CGSB-1-GP-300 specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Place and secure on prepared base.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb (445 N).

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install accessories.

H. Replace components that do not operate smoothly.

3.3 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 7316.13
METAL CANOPIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Attached metal canopies.

1.2 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

E. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

H. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

I. ASTM E2950 - Standard Specification for Metal Canopy Systems; 2014 (Reapproved 2020).

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.

D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

E. Manufacturer's Qualification Statement.

F. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Brewster Central School District's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in New York. Submitted by GC for review.

1. Comply with applicable code for submission of design calculations as required for acquiring permits.
2. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
1. Not less than three years of documented experience.

C. Erector Qualifications: Company specializing in performing the work of this section.
1. Not less than three years of documented experience and approved by canopy manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site ready for erection.

B. Package using methods that prevent damage during shipping and storage on site.

C. Store materials under cover and elevated above grade.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Canopies:
1. MAPES Architectural Canopies, mapes.com
a. Super Lumideck Flat Soffit
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 METAL CANOPIES

A. Shop Fabricated Aluminum Canopy

B. Configuration: Layout and dimensions, canopy clearance, fascia profile, and roof covering design as indicated on drawings.
1. Installation: Face-mounted to building structure. Brick/Block with thru bolt sleeve. See drawing details.

C. Performance Requirements:
1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
2. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F (49 degrees C) and surface temperature range of 180 degrees F (82 degrees C) without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

2.3 COMPONENTS

A. Structural Aluminum Framing: Alloy and temper 6063-T5, 6063-T6, or 6061-T6.
1. Extruded Shapes and Tubes: ASTM B221 (ASTM B221M).
2. Rolled or Extruded Structural Shapes: ASTM B308/B308M.

B. Covering:
1. Aluminum Decking:
a. Interlocking extruded aluminum decking modules.

a) Extruded Decking: ASTM B221 (ASTM B221M), Alloy and temper 6005-T5, 6061-T6, or 6063-T6.

C. Exposed Gutters and Downspouts: Aluminum with AAMA 2604 organic coating, color to match canopy covering, manufacturer's recommended size for canopy specified.

2.4 SHOP FABRICATION

A. Provide a complete system ready for erection at project site.

B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

C. Weld steel members in accordance with AWS D1.1/D1.1M.

D. Weld aluminum members in accordance with AWS D1.2/D1.2M.

E. Fabricate connections for bolt, nut, and washer connectors.

2.5 FINISHES

A. Structural Steel Framing:
1. Shop Primer: Rust-inhibitive red oxide.

B. Aluminum Framing and Decking:
1. High Performance Organic Coatings: AAMA 2604, multiple coats, thermally cured, fluoropolymer system.
2. Color: As selected by architect from manufacturers complete range of colors..

C. Fascia: Fluoropolymer finish; color as selected from manufacturer's standard range.

2.6 Accessories

A. Trim and Closure Pieces: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.
1. Exposed Fasteners: Not permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify that wall anchors and all components are in correct position.

C. Do not proceed with installation until all conditions are satisfactory.

3.2 Installation - Framing

A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.

B. Do not field cut or alter structural members without approval.

C. After erection, prime welds, abrasions, and surfaces not shop primed.

3.3 INSTALLATION - Canopy Covering

A. Install in accordance with manufacturer's instructions.

B. Fasten metal decking to metal support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.4 TOLERANCES

A. Maximum Variation from Level: Plus/Minus 1/8 inch (3.175 mm).

3.5 CLEANING

A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.6 PROTECTION

A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION

SECTION 114000 - FOODSERVICE EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Work of this Section shall conform to the requirements of the Contract Documents including drawings and general provisions of the Contract, General and Supplementary Conditions and Division 01 Specification Sections.

1.2 BIDS

A. Unless otherwise noted, Kitchen Equipment Contractor (KEC) is a sub-contractor to the General Contractor (GC) and is to provide and install all items listed in this section and as detailed on food service drawings.

B. Raymond/ Raymond Associates is herein identified as the Food Service Consultant.

C. Bids must be based on equipment of manufacturers specified; no substitution will be accepted after award of Contract.

D. Substitutions: When a product or material is specified by name and or model number, as noted in these specifications, such specifications establishes the standard type and quality considered most satisfactory for the particular purpose in the building. The bid proposal therefore should be based thereon, so that all bidders bid under the same conditions.

1. In providing substitution requests, the bidder must prove equivalence of the substitution and furnish detailed specifications and catalog cuts or drawings. Failure to identify exceptions or deviations from equipment specified must be interpreted to indicate that the product offered complies with the specification in every respect.

E. Custom fabrication, millwork, equipment, etc. must be built by a company continually in business for at least a 5-year period.

F. Contract documents convey a method of construction for custom fabrication; however this may or may not be the appropriate method based on selected fabricators industry knowledge and standards. It will be the responsibility of the selected fabricator to interpret and apply appropriate methods of construction for full functionality of custom fabrication.

1.3 WORK INCLUDED

A. KEC shall coordinate with other trades or sub-contractors in order that whole installation may result in the highest grade possible.

B. KEC shall provide and install only such valves, traps, faucets, shut-offs, reducing pressure valves, relief valves and other specialty items required within equipment and as hereinafter specified.

C. KEC shall make all necessary cut-outs and knock-outs where required on equipment to accommodate electrical receptacles, switches or other electrical outlets and equipment, together with such cut-outs as required for passage of gas or plumbing piping, etc.

D. KEC shall stack and remove rubbish waste material, crating, etc., resulting from work and keep the premises clean at all times. Upon completion of the installation, thoroughly and finally clean all equipment ready for use.

1.4 POWER AVAILABLE

A. Electric Voltage: 120/208/480 volt, 60 cycle, 1 & 3 ph.

B. Water Pressure: Typical Food Service Equipment range 25 to 90 PSI, if required, pressure reducing valves provided by Plumbing Contractor.

C. Water Temperature(s):

1. 110°-120° Fahrenheit max at hand washing sinks, work sinks and preparation sinks.
2. 120°-140° Fahrenheit max at 3-compartment pot sink, dishwashers and hose reel assembly.
3. 110°-120° Fahrenheit max at cooking equipment with faucet assembly.

D. Gas Pressure: Typical Food Service Equipment range 5" W.C. to 10" W.C., if required, a gas pressure reducing valve at main feed, prior to equipment connection, to be provided by Plumbing Contractor.

1.5 GENERAL CHARACTERISTICS OF EQUIPMENT

A. Electrically Operated

1. Electrically operated equipment to be listed by Underwriters Labs., Inc.
2. Motors: Up to and including 3/4 horsepower, shall be 120/60/1.
3. Motors: Over 3/4 horsepower, 208/60/3, unless otherwise indicated.
4. Ranges, food warmers, etc., over 2.0 kW, 208/60/1 or 208/60/3, unless otherwise indicated.
5. Electrically heated equipment, etc., 2.0 kW and under, 120/60/1.
6. 1 ph. electrical plug-in units with 3 wire cords; 3 wire cap.
7. 3 ph. electrical plug-in units with 4 wire cords; 4 wire cap.
8. Motor driven equipment: equipped with starting switch.
9. Motors: equipped with overload protection.
10. Wiring on fixtures, including operating switches and pilots, furnished by Kitchen Equipment Contractor.

B. Submit in writing to Architect and Food Service Consultant for approval, schedule showing proposed electrical characteristics of each piece of equipment and disconnect means provided.

C. Punch holes for, and install hood and walk-in cooler/freezer lights and concealed conduits. The interconnection of same, including control switch, wiring, inter-wiring between sections, etc., by Electrical Contractor.

1.6 WORK EXCLUDED FROM THIS DIVISION

A. The following work is to be performed by other trades or sub-contractors and is not the responsibility of the Kitchen Equipment Contractor. The GC is responsible to hire all necessary sub-contractors.

1. Electrical Contractor
   a. Make connections to all food service equipment as shown.
   b. Furnish disconnect switches.
   c. Interconnecting of all exhaust hood lights, switches, control packages, interfaces, etc. including inter-wiring between sections of exhaust hoods.
   d. Interconnecting of control switches as required on equipment shown, and all other components which come as part of any equipment shown on plan.
   e. Interconnecting of any equipment, including, but not limited to, walk-in coolers/ freezers monitoring, exhaust hood monitoring and/ or fire protection monitoring with building management systems.
   f. Review all manufacturer approved installation methods/ diagrams and comply for proper installation of equipment being furnished.
2. Plumbing Contractor
   a. Make hot and cold water, waste and gas connections to all kitchen equipment shown, furnishing all necessary shut-offs, traps, backflow preventers, vacuum breakers, grease traps, drain line runs, etc.
   b. Install all faucets, pot fillers, filters and pressure regulators as furnished by Kitchen Equipment Contractor.
   c. Interconnecting of any and all other components that come as part of any other equipment shown.
   d. Provide floor drains and floor sinks where shown and indirect piping to floor drains and floor sinks as indicated on drawings.

e. Review all manufacturer approved installation methods/ diagrams and comply for proper installation of equipment being furnished.

3. Ventilation Contractor
   a. Furnish size, shape and location of vent collars for exhaust hood and make connections to these collars.
4. General Contractor
   a. Provide and/or coordinate all work to the floors, walls and ceilings of the space.
   b. Provide wall blocking where required and as indicated on food service drawings.

1.7 SUB-CONTRACTORS TO KITCHEN EQUIPMENT CONTRACTOR

A. Fire Protection Contractor for the wet chemical protection system within exhaust hood systems only and Refrigeration Contractor for the remote refrigeration packages for walk-in coolers/ freezers, rack systems, etc. are typical sub-contractors to the Kitchen Equipment Contractor.

B. KEC to provide the name and addresses of all sub-contractors furnished to Architect/Owner and Food Service Consultant at time of submitting shop drawings. Selection of sub-contractors must be approved by them; and if in their judgment any fail to prosecute work in strict accordance with drawings and contract, after due notice from Owner or his agent, shall discharge same, but this in no way releases Kitchen Equipment Contractor from his obligations and responsibility under the contract.

C. Every sub-contractor bound by terms and provisions of the contract so far as applicable to his work. Nothing contained herein shall create any contractual relations between any sub-contractor and Owner.

D. Kitchen Equipment Contractor fully responsible to Owner for acts and omissions of his/ her sub-contractors.

1.8 SHOP DRAWINGS, ETC.

A. Immediately upon award of Contract and within 4 weeks, submit to Architect/Owner and Food Service Consultant, drawings for approval. Submit 1/4" scale rough-in drawings showing locations of plumbing and electrical connections with all requirements indicated at point of connection; use of a legend or numbered connection plan will be cause for drawing rejection. Prior to fabrication, submit to Architect for approval 1/2" scale shop drawings showing plan, elevations and isometric views covering all items of work. Drawings to show dimensions and details of construction, installation and relations to adjoining and related work where same requires cutting or close fitting. Show reinforcement, anchorage, etc., required for complete installation. After correction and approval of above, submit sets for record, then afterwards as many additional copies as required by client.

B. Submit in same manner as above, drawings showing masonry bases, depressed floors, positions of walls, requirements for ceiling hangers, wall blocking, and any other special conditions necessary for complete and correct correlation of various trades for satisfactory installation of all equipment shown on drawings.

C. Manufacturer's names, cuts, descriptive data, analysis of tests, rated capacities and other information necessary for approval of standard manufactured articles and equipment furnished to Architect/Owner and Food Service Consultant for approval before ordering or purchasing. This submission made in same manner as above. All cuts marked with item number, mechanical characteristics, accessories furnished and bound in folders.

1.9 GENERAL

A. No machine or equipment acceptable from any manufacturer not having had equipment of approximately the same type and design as that specified operating successfully for at least 5 years. Machines installed for test purposes shall not come within the category of successful commercial operation.

B. Architect/Owner and/or Food Service Consultant privileged to inspect material and fabrication at Kitchen Equipment Contractor's or its sub-contractors factory at any time.

C. Before proceeding with shop work, Kitchen Equipment Contractor to verify all measurements at premises. Where required dimensions are not immediately obtainable and delay in waiting for these dimensions would cause work to be seriously delayed, the matter shall be referred to Architect for a decision. In obtaining measurements, Kitchen Equipment Contractor shall consider work requirements of

other trades and equipment designed and fabricated to provide necessary clearance for surrounding and adjoining work.

D. Kitchen Equipment Contractor responsible for making any and all necessary adjustments to complete his work in a workmanlike manner, as approved by Architect/Owner.

E. Dimensions as indicated on drawings and specifications are approximate, and are to be adjusted if and where necessary to suit job conditions and field measurements.

F. Tops of tables, shelves, tops and exterior panels of cabinets, counters, doors, drainboards, etc., to be constructed of a single sheet of metal. Where size of equipment requires more than 1 sheet of metal, sheets butt joined with joints continuously welded full length. No joints less than 18" from an edge or end of a piece of equipment. In addition, all joints shall have battens or stiffeners welded to jointed material, ground smooth and polished.

G. Appliances of rigid construction free from objectionable vibration and quiet in operation.

H. Electrical heating elements shall conform to latest standards of National Electrical Manufacturer's Association and Underwriters Labs., Inc., where applicable standards have been set up by such agencies.

I. Motors of ample power to operate machines for which designated under full load operating conditions without exceeding nameplate ratings. Horsepower requirements on driven equipment determined by manufacturer, based on normal operation of maximum capacity.

J. Motors drip-proof, splash-proof or totally enclosed type, having two-hour duty cycle and ball bearings (except small timing motors which may have sleeve bearings). All motors shall have windings impregnated to resist moisture. Motors located where adjacent to deposits of dust, lint, etc., totally enclosed type.

K. It is the responsibility of the Kitchen Equipment Contractor to supply and mount all electrical outlets, switches, controls, etc. within table/counter back splashes, aprons, panels, etc. and to provide stainless steel cover plates as required. Furthermore, it is the responsibility of the Electrical Contractor, in coordination with the Kitchen Equipment Contractor, to make final interconnections within table/counter interior to junction boxes, outlets, switches, controls, etc. for equipment indicated.

1.10 STAINLESS STEEL (S.S.)

A. Where S.S. is specified, it shall be Type 304, nickel bearing iron alloy, containing approximately 17.0% to 19% chromium, 8% to 10% nickel, not more than 0.2% carbon, and not more than 2.0% of other alloying elements; designed being austenitic (non-magnetic).

B. S.S. free from scale with all surfaces polished to a high commercial finish. All welding and exposed welds hereinafter specified, must be ground down and polished smooth to a #4 finish so that no evidence of welding will appear. Unexposed welds on underside of counter or tables ground smooth and treated with an acid solution to remove weld discoloration and oxidization and to arrest corrosion.

C. Undersides of all counters, work tables, sinks, drain boards, etc., after fabrication, to have one (1) heavy coat of sound deadening material applied as allowed by local codes.

D. Gauges for sheet iron and sheet metal, U.S. Standard.

E. Rivets, welds, bolts, screws, nuts and washers to be steel except where brass or S.S. is fastened, in which case they shall be brass or S.S., respectively. Where dissimilar metals are fastened, welds, bolts, rivets, screws, nuts and washers, highest grade metal. Spacing and extent of welds, rivets, bolts and screws such as to insure suitable fastening and prevent bulging of metals fastened.

1.11 SANITATION

A. All custom built equipment constructed in accordance with standard No. 2, 4 & 7 of National Sanitation Foundation Testing Laboratory, manufactured by a company approved by N.S.F. and carry their stamp of approval. Kitchen Equipment Contractor must have "Registered" numbered seal of N.S.F. approval.

1.12 OPERATING INSTRUCTIONS

A. Kitchen Equipment Contractor shall leave all items of equipment in good, operating condition and furnish the services of a "qualified" competent manufacturer's representative to instruct Owner's employees in

proper use and care of equipment. Representative on call for as long a period as is necessary to assure Owner that such instruction is thoroughly understood.

B. Kitchen Equipment Contractor shall be responsible for scheduling of equipment demonstrations and/or training and shall provide a detailed list of expected dates, times and manufacturer's representative to be present (in attendance) for each piece of equipment.

C. Kitchen Equipment Contractor or his qualified manufacturer's representative, thereafter, shall make all necessary calls during warranty period.

1.13 SAMPLES

A. After Award of Contract, when requested, Kitchen Equipment Contractor shall supply Architect with samples of fabricated equipment, such as corner of table with a rolled or inverted "V" edge, corner of dish table, overshelf, drawer assembly, table leg with foot and gusset, or as specifically requested.

1.14 GUARANTEE

A. Kitchen Equipment Contractor shall guarantee, as part of the bid and/or contract, workmanship, material and equipment for a period of 1 year from date of equipment final install and project turnover to Owner, and shall remedy any defect due to faulty workmanship or materials which may appear within guarantee period.

B. Manufacturer's operation and maintenance manuals on equipment, etc., turned over to the Owner in duplicate, bound in a folder and marked accordingly.

1.15 EQUIPMENT CONSTRUCTION AND STANDARDS

A. Where initials S.S. are used, they refer to "stainless steel;" C.P. refers to "chrome plated;" N.I.C. refers to "not in contract;" G.I. refers to "galvanized iron;" F.D. refers to "floor drain", and F.S. refers to "floor sink."

1.16 WASTES AND OVERFLOWS

A. Sinks to have the following waste and overflow assemblies:

1. For 1-1/2" NPT: Fisher model 74043 or approved alternate. Lever handle waste outlet with overflow assembly, 3-1/2" sink opening, self-centering stainless steel face flange with flat strainer, 12 gpm max flow rate, stainless steel lever handle with ball, overflow head with stainless steel faceplate and chrome plated cast red brass drain body.
2. For 2" NPT: Fisher model 74043 or approved alternate. Lever handle waste outlet with overflow assembly, 3-1/2" sink opening, self-centering stainless steel face flange with flat strainer, 12 gpm max flow rate, stainless steel lever handle with ball, overflow head with stainless steel faceplate and chrome plated cast red brass drain body.

1.17 WATER INLET LOCATION

A. Located in all cases above the positive water level to prevent siphoning of liquid into water system. Wherever conditions require water inlet below such level, a suitable type of vacuum breaker shall be placed on fixture and form part of same to prevent such siphoning.

B. All faucets furnished by Kitchen Equipment Contractor as specified. Traps furnished by Plumbing Contractor.

1.18 PITCH AND DRAINAGE

A. Wherever a fixture is used with waste or drain outlet, surface shall have distinct pitch towards outlet. Drainboards and tables that contain or adjoin sinks shall have a definite pitch towards sinks. Where necessary, surfaces creased and grooved to give a definite pitch.

1.19 SINKS

A. #14 gauge S.S. interior corners rounded to 1" radius horizontally and vertically, forming a cove in bottom. All joints butt edged. Sink sizes given, inside measurements.

B. Bottom of each compartment creased to center and fitted with a rotary drain as described in section 1.16, hereinbefore specified. Waste lever not to protrude beyond body of sink. Sinks to have overflows installed by Kitchen Equipment Contractor.

C. Overflow to consist of 1-1/2" chrome plated brass strainer plate, fitted in back of each compartment at proper level directly connected to waste outlet with 1-1/2" chrome plated brass pipe.

D. Back of sink extended integrally approximately 12" above working level, back 2-1/4" on 45° angle towards rear and then flanged down 1" and punched to accommodate faucets.

E. Front and both ends, unless otherwise specified and shown, finished on top edge, 3" above working level, with 1-1/2" diameter, 180° welded integral roll. Exterior corners rounded to a 2-1/2" radius, all integrally welded.

F. Sinks and drainboards finished on front and back edges only and left with straight edge on ends, so that drainboards may be welded thereto, forming integral units with top edge of rolled rim curbing formed on one horizontal plane across front to unit though surfaces of drainboards pitched to sinks.

G. Multiple compartment sinks divided with double wall #14 gauge S.S. partitions, all corners rounded same as corners in sinks, continuously welded in place.

H. Back, bottom and front of one continuous piece with no overlapping joints or open spaces between compartments.

1.20 SINK BOWL BUILT INTO TABLE TOP

A. Sink constructed integral with table top #14 gauge S.S. having all interior corners coved vertically and horizontally forming a cove in bottom. To have overflow, lever waste outlet, etc…, as hereinbefore specified for sinks in spec section 1.19.

B. All joints butt edged and welded, ground and polished, so that no evidence of welding will appear. All sink sizes inside measurements. Table top where shown, punched to receive deck type combination faucets, provided by Kitchen Equipment Contractor.

1.21 FAUCET AND BASKET DRAIN ASSEMBLY

A. Sinks to have the following faucet assemblies:

1. 3-Compartment Sink, Potwash:
   a. 1 ea. Fisher model 74306 or approved alternate. Pre-Rinse assembly with 1.3 gpm flow rate or less, splash/ wall mount, 8" centers, add-on faucet 12" stainless steel tubular swing spout with 4" wrist blade handles, 36" flexible gooseneck hose with spray head, stainless steel spring with wall bracket, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Deck mount assembly model 75485.
   b. 1 ea. Fisher model 60798 or approved alternate. Faucet with 2.2 gpm flow rate or less, splash/ wall mount with 4" wrist blade handles, 8" centers, 12" stainless steel tubular swing spout, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Deck mount assembly model 57665.
2. 2-Compartment Sink, Preparation:
   a. 1 ea. Fisher model 57665 or approved alternate. Faucet with 2.2 gpm flow rate or less, deck mount with 4" wrist blade handles, 8" centers, 12" stainless steel tubular swing spout, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Splash/ wall mount assembly model 60798.
3. Work Sink (Built-in, Welded-In):
   a. 1 ea. Fisher model 57665 or approved alternate. Faucet with 2.2 gpm flow rate or less, deck mount with 4" wrist blade handles, 8" centers, 12" stainless steel tubular swing spout, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Splash/ wall mount assembly model 60798.
4. Hand Sink:
   a. 1 ea. Fisher model 58696 or approved alternate. Faucet with 2.2 gpm flow rate or less, deck mount with 4" wrist blade handles, 4" centers, 6" stainless steel swivel gooseneck spout, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Splash/ wall mount assembly model 62650.

B. All plumbing fixtures shall be certified CSA, ASME A112.18.1/CSA B125.1, AB1953/HSC 116875, Vermont Bill S152, NSF/ANSI 61 sec 9, annex F and G, NSF/ANSI 372 low lead content, ASTM F2324.

1.22 DRAINBOARDS

A. #14 gauge S.S. full width of sink carried up approximately 12" at back and where adjacent to wall and finished same as heretofore described for back of sink, and having 3" high curbing at front and ends not adjacent to walls and finished with integral 1-1/2" diameter 180° roll, unless otherwise specified.

B. Drainboards continuously welded to sinks.

C. Drainboards 30" long or less shall have 1-1/2" #16 gauge S.S. tubular braces secured at underside near front and welded to S.S. gusset at leg anchor. All others to have legs and cross bracing with full length and width undershelf as specified for tables.

1.23 TABLES WITH S.S. TOPS

A. Tops of #14 gauge S.S. 1 piece construction with all edges turned down into 2" integral 180° roll with all corners rounded to 2" radius forming a bullnosed corner. Corner welded and polished smooth.

B. Table tops thoroughly cross braced with 4" x 1" S.S. channel stiffeners #14 gauge welded to underside. All cross braces spaced not over 24" on center.

C. Table tops adjoining walls or adjacent equipment carried up approximately 6" and returned 1", down 1" at top and ends. Intersections of table top and raised edge coved to 1" radius. Where backsplash is exposed, it shall have finished S.S. back.

D. It is the responsibility of the K.E.C. to supply and mount all electrical outlets, switches, controls, etc. within table/counter back splashes, aprons, panels, etc. and to provide S.S. cover plates as required. Furthermore, it is the responsibility of the Electrical Contractor, in coordination with the Kitchen Equipment Contractor, to make final interconnections within table/counter interior to junction boxes, outlets, switches, controls, etc. for equipment indicated, if required.

1.24 LEGS AND CROSSRAILS

A. 1-5/8" O.D. #14 gauge S.S. tubular-type with S.S. bullet shaped feet having minimum vertical adjustment of 1-1/2" without showing threading or adjusting bolts. Feet fully enclosed on bottom. Adjustment of feet by means of a threaded shank attached to foot and screwed into a properly secured threaded member inside of leg. Construction of leg such that it shall fit over shank of foot so no liquid or other material can work their way into legs or foot.

B. Tops of legs attached to enclosed conical gussets of heavy gauge S.S. Gussets welded to #14 gauge S.S. 4" x 1" channels to underside on which they appear. Crossrails 1-1/2" O.D. #14 gauge S.S. coped and welded to legs approximately 10" A.F.F. or as specified.

1.25 OVERSHELF - TABLE TYPE

A. #16 gauge polished S.S. with all edges turned down and finished in a 1-1/2" diameter 180° roll - corners bullnosed, welded 1 piece construction.

B. Shelves supported by 1" O.D. #14 gauge S.S. tubular uprights, tapered at top and flared at bottom, secured to table top with concealed inner tie rods, bolts and nuts. Uprights spaced approximately 42" on center not to interfere with table top proper. When uprights are located in other areas in addition to each end of table then they shall be cantilevered.

1.26 OVERSHELF - WALL TYPE

A. #16 gauge polished S.S. with back edge turned up 2", remaining ends turned down in 1-1/2" diameter 180° roll with corners bullnosed welded, ground and polished.

B. Shelves supported by #12 gauge S.S. cantilever brackets. Shelf spaced 1" from walls when in place and secured to same with C.P. toggle bolts. Undersides secured to brackets with concealed welded studs, nuts and washers. Brackets spaced approximately 42" on center.

1.27 UNDERSHELVES

A. #16 gauge polished S.S. full length and width of table with all edges turned down into 2" wide channel. In way of table legs, shelf notched to fit contour of legs and fitted to same in neat, workmanlike manner to eliminate unsanitary crevices, fully welded, ground and polished.

B. Undershelves reinforced on underside with welded 4" x 1" longitudinal channels of #14 gauge S.S. where applicable. All signs of welding on shelf surface removed.

1.28 DRAWERS

A. Of #18 gauge S.S. all interior corners coved to a 1" radius both vertically and horizontally. All welds ground and polished to a uniform finish.

B. Front of #14 gauge polished S.S. and will extend on both sides of drawer body to conceal slides, corners welded, ground and polished. Space between drawer front and body fully enclosed at bottom, back and both sides by means of a #20 gauge S.S. filler, spot welded to drawer front and body, to provide a fully sealed, vermin-proof enclosure. Drawer front provided with a 5" C.H.G. # P46-1010 S.S. pull handle fastened in place by means of a concealed screws.

C. Drawer slides of #14 gauge S.S. fitted with 4 case hardened ball bearing rollers. Track attached to drawer is to have upper edge channel shaped to fit contour of roller rim to provide a positive drawer guide and prevent jarring. This drawer track firmly spot-welded to body. Outer track provided with auto stops to lock without the use of tools.

D. Where specified, drawer provided with removable synthetic carving board. Carving board is to slide into enclosure under drawer made of #14 gauge S.S. and extending across underside of carving board, with both sides turned up and welded to slide assembly. The 2 sides provided with #14 gauge S.S. angles with stops at rear fastened in place 1/8" above top surface of carving board to provide guide and storage compartment when carving board is not in use. Carving board is to measure approximately 21" x 21" x 1" thick.

E. Tool drawer 20" x 20" x 5" deep, bread drawer 20" x 20" x 10" deep. All drawers to have 4 pin paracentric keyed-alike built-in locks same as sliding and hinged doors. C.P. where exposed.

1.29 NOT USED

1.30 NOT USED

1.31 VENT STACKS

A. Vent Stack of proper size to fit dishwashing machine end cowl, #18 gauge S.S., continuously welded. Both vents over openings of dishwashing machine, sized per manufacturers specifications and provided with a revolving damper of #16 gauge S.S. Damper attached to externally operated "T" handle made of 3/8" diameter S.S. rod and with tension spring to prevent it from rotating freely. Top of each vent shall terminate into duct above. Extend top to approximately 6" above finished ceiling to receive duct connections by others.

1.32 FIRE PROTECTION SYSTEM

A. The system shall be a pre-engineered cartridge-operated type R-102 system utilizing Liquid Ansulex agent, with a Fixed Nozzle distribution network. It shall be furnished and installed in compliance with UL Standard 1254, UL Standard 300, NFPA 96-2008 and any prevailing statutes or codes including automatic shut-down of all cooking appliances per code section 44 of NFPA 17A-27-2002.

B. System to provide connection to building Fire Alarm System per NFPA 17A; Section 3-2.1.5.

C. Fire protection remote pull stations mounted @ 48" AFF, located 10 ft. minimum to 20 ft. maximum from exhaust hood(s).

D. The extinguishing agent shall be a specifically formulated aqueous solution of organic salts contained in a S.S. tank with 3 gallons minimum capacity, and able to withstand test pressure of 330 PSI. A welded S.S. bracket shall be provided for mounting the tank.

E. The regulator releases mechanism shall be capable of providing sufficient expellant gas to discharge enough agent to meet the minimum nozzle discharge requirements. The mechanism shall have a visual indicator of "fired" condition. This mechanism shall be capable of being operated by fusible link

detection, remote manual release and local manual release. The mechanism should be housed in a S.S. enclosure with cover containing identifications thereon.

F. Each discharge nozzle to be listed with UL approval for placement and size. Each nozzle shall have a rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up. All exposed piping to be chrome plated finish, and there shall be no exposed threads.

G. Kitchen Equipment Contractor to furnish mechanical (electrical) gas valve, up to 3" in size and coordinate the install/provisions to shut-off all fuel supplies to all cooking appliances beneath Type I exhaust hood upon activation of system. If electrical gas valve is to be utilized, Kitchen Equipment Contractor to furnish reset relay push button.

It is the responsibility of the Plumbing Contractor to install, coordinate and make any provisions necessary for complete operation of gas valve.

It is the responsibility of the Electrical Contractor to furnish and install electrical wiring, relays, etc... and make any provisions necessary for complete operation of gas valve. In addition, Electrical Contractor to furnish and install automatic equipment necessary to shut-off all electric beneath Type I exhaust hood upon activation of system.

H. Kitchen Equipment Contractor to furnish and install a Class K Fire Extinguisher, dedicated to each room where a Type I exhaust hood is installed.

I. Upon completion of installation, the installer to perform a wet chemical test or at the time of the test, the authority having jurisdiction may allow the Contractor to use flushing concentrate and water solution. However, whichever is permitted, it must be in compliance with Code. This test shall activate the entire system, except the agent supply tank, which will be substituted by the test tank of like pressure and size. Following a satisfactory test, the original tank shall be replaced. The system shall then be certified to be in working order and all authorities shall be so advised in writing. Provide Owner with copies of all satisfaction/acceptance tests.

J. The system to be furnished and installed by a factory distributor in accordance with the manufacturer's instructions. This shall include mounting of the system units, manual releases, nozzles, actuating devices, and the running of all pipe and control tubing applicable to the R-102 system. If and when requested, submittal drawings concerning the fire system shall have affixed the seal and signature of a licensed engineer for the State in which they are to be installed. A 1-year service contract and maintenance program to be provided.

K. Kitchen Equipment Contractor is required to submit a copy of the hood suppression system shop drawing to the local authority having jurisdiction for approval, as well as submission to the Architect. In addition, shop drawings when submitted, must be signed and sealed by an engineer licensed to practice in the State where the system is to be installed.

1.33 DISH TABLES - SOILED AND CLEAN

A. #14 gauge polished S.S. with exposed edges finished in 3" high curbing with a 1-1/2" diameter, 180° rolled trim at top, corners bullnosed, welded. Where adjacent to wall, top carried up 12" integrally at top and ends. All joints in top welded and free of buckles and weld marks. When applicable, where top (also raised back), adjoins dishwashing machine, same flanged down 1" into machine and secured water tight, backsplash in this area brought forward diagonally to machine to form a baffle. Tops thoroughly cross braced with 4" x 1" channel stiffeners of #14 gauge S.S. and welded to underside. Cross bracing approximately 24" on center, running front to back. All corners in top rounded to 1" radius, vertically and horizontally.

1.34 NOT USED

1.35 NOT USED

1.36 PRE-WASH SINK

A. Approximately 21" x 21" x 7" deep, of #14 gauge S.S. integrally welded to table top, forming an integral unit with same. Sink bowl identical to that specified for sink built into table top including basket drain assembly with built-in overflow, etc. Sink pitched to a 2" IPS C.P. brass "lever" waste outlet and fitted

with a #18 gauge S.S. snug fitting basket approximately 19" x 19" x 6" deep, with continuous perforation and reinforced top edges and 4 sides. Basket of all welded construction mounted on 2" high S.S. feet.

B. Top of pre-wash sink fitted with S.S. guide for dish racks. Guide of 1-1/2" x 1-1/2" x #12 gauge S.S. angles with ends flared out to facilitate easy movement of racks. Guide welded to cross angles of same material, thus forming a removable frame. Dish table backsplash (unless otherwise specified and shown) in area where pre-wash sink is located, provided with Fisher Mfg. Co. stainless steel pre-rinse unit model #33308 includes wall bracket, shortened riser pipe to 16", add on faucet with 12" swing spout, nipples, elbows, backflow preventer mounted on pre rinse unit, mixing faucet with S.S. seats and check valve stems to prevent cross flow, EPAct 2005 certified.

1.37 NOT USED

1.38 NOT USED

1.39 SERVING COUNTER

A. Of size and shape as shown. Top of #14 gauge polished S.S. rolled down in a 2" diameter 180° roll on all exposed edges with corners bullnosed, welded. Top secured to counter base by means of concealed S.S. studs, nuts and washers. Angle frame under top sheathed with sound deadening material.

B. Base constructed with interior framing of 1-1/2" x 1 1/2" x 1/8" galvanized steel angle with all joints welded.

C. Angle framework concealed on the interior with #18 gauge polished S.S. sheathing. Exterior facing of base cabinet and ends to have sheathing of Plastic Laminate paneling laminated to 3/4" thick solid core, exterior grade marine plywood, panel length not to exceed 36". Color and style of paneling selected by Architect. Each panel of length as indicated, full height of counter and splined hairline joints. Panels and trim secured to interior framing by means of concealed welded studs, nuts and washers. Or constructed of alternate materials as detailed on drawings.

D. Interior of all available space provided with bottom and intermediate shelf of #16 gauge S.S. turned up approximately 2" at rear and ends, and down 1-1/2", and in 1/2" channel shape at front.

E. Mounted on masonry base, height as indicated on drawings or 6" high 14 gauge S.S. legs with S.S. removable toe base, where indicated. All openings in top flanged downward approximately 1" around their entire perimeter. Top cut out for and provided with equipment as hereafter specified.

F. It is the responsibility of the K.E.C. to supply and mount all electrical outlets, switches, controls, etc. within table/counter back splashes, aprons, panels, etc. and to provide S.S. cover plates as required. Furthermore, it is the responsibility of the Electrical Contractor, in coordination with the Kitchen Equipment Contractor, to make final interconnections within serving counter interior to junction boxes, outlets, switches, controls, etc. for equipment indicated, if required.

1.40 NOT USED

1.41 NOT USED

1.42 NOT USED

1.43 NOT USED

1.44 TRAY SLIDE

A. Of size and shape, as hereinafter specified and/or shown on contract drawings. Installed where shown, 12" wide, #14 gauge S.S. construction or in strict accordance to that as detailed on drawings.

B. In general, unit mounted on #12 gauge S.S. ornamental type brackets secured to front trim of counter in a concealed manner with welded concealed studs. Back edge of turned up section made to fit tight with turned down front section of counter top and definitely free of voids, cracks and unsanitary joints.

1.45 NOT USED

1.46 NOT USED

1.47 COUNTER AND CABINETS WITH SEMI-ENCLOSED BASE

A. Top of #14 gauge polished S.S. finished 1/2" above working level with 2" diameter 180° roll, bullnosed corners on all exposed sides. Where adjacent to wall, top carried up approximately 6" (or as specified

hereinafter and shown) and returned 1" at top and ends towards wall with corners welded forming a continuous unit. Top fastened to cabinet by means of welded and concealed studs.

B. Cabinet below top to have #18 gauge S.S. enclosure. Front stiles of cabinet channel shaped. This channel fully enclosed inside of cabinet. Top reinforced by means of horizontal framework of S.S. 1-1/2" x 1-1/2" x 1/8" angle with cross braces not more than 18" on center Framework of all welded construction and intermediate shelves in cabinet of #16 gauge S.S. turned up on all sides to eliminate crevices at shelf surface. Front edge of shelf channel shaped. Shelf surface reinforced by means of #16 gauge S.S. channel stiffeners spaced on not more than 24" on center. Mounted on 6" S.S. adjustable legs, or as hereinbefore shown and specified.

1.48 NOT USED

1.49 DOORS

A. Whether sliding or hinged type, not less than 1/2" thick overall, double paneled having 3/8" sound-deadening material between #16 gauge S.S. front and #18 gauge S.S. back, reinforced between panels by wide channels, running height of door and made of same material. Panels jointed with continuous welding. Doors and vent openings to have back panel boxed around vent opening and welded to front panel. Doors dust proof and entire front face without seams or joints.

B. Sliding doors mounted on ball bearing type rollers, sliding in dust proof #14 gauge S.S. tracks overhead, fastened so as to eliminate vibration and jarring when doors are rolled. Doors fitted with limit stops. Bottom guide of #14 gauge S.S. for doors, open and flat, lining up with lower shelf of cabinet - slots so arranged that crumbs or dirt accumulating in the cabinet will drop to the floor when cabinet is cleaned. Recessed handles solid material, not stamped, of S.S. welded to front panel. Finger grips of ample depth to comfortably pull the door. Doors provided with keyed-alike S.S. faced cylinder locks, built-in flush.

C. Hinged type doors flush fitting, unless otherwise specified, resting tightly against rabbetted frame. Hinged doors provided with Klein Model #Y-48 (or approved equal) keyed-alike S.S. faced cylinder locks with Model #12230-SM (or approved equal) handles. In case of pair of doors, each individually controlled as outlined and is to close against rubber bumpers.

D. Outer edges smooth, free from burrs, projections and fins. Excess welded metal removed by precision grinding and polishing.

1.50 REFRIGERATORS AND REFRIGERATION UNITS

A. Reach-in refrigerators, freezers, and refrigerated units, as shown unless otherwise specified, furnished by Kitchen Equipment Contractor They shall meet all requirements as set forth for individual item number and complete with self-contained or remote compressors and motors. Cooling coils blower type, unless otherwise called for, provided with initial charge of approved CFC free refrigerant. Plumbing Contractor responsible for extending refrigerator drain line, where required, to spill into adjacent floor drain in approved manner. Extended drain line not less than 3/4" I.D. and C.P. or S.S. tubing.

B. All refrigerated equipment, refrigerators and freezers, whether walk-in or reach-in, started and adjusted to maintain required temperatures, charged with approved refrigerant as required.

C. All reach-in refrigerators, freezers, hot food warmers, etc., to have keyed-alike locks. Kitchen Equipment Contractor must request this at time of placing order to avoid correction at a later date at Kitchen Equipment Contractor's expense.

D. Kitchen Equipment Contractor to provide 1 year's free service for all types of refrigerators and refrigeration equipment. Service to include all compressors, unit coolers, controls, etc., to include adjustments and repairs, irrespective of cause, whether mechanical, operational or manufacturing at no additional cost to Owner. Additionally, five (5) year warranty provided on all compressors, parts only or replacement.

1.51 WALK-IN COOLER AND FREEZER

A. General Description: To be N.S.F. approved units, of size and manufacturer as indicated on contract drawings, 8'-6" high, unless otherwise specified, completely furnished and assembled unit installed in an approved manner. As indicated on drawing, either installed into a 6-1/2" depressed floor area with flush type door sill and floor finish as shown on contract drawings, or installed directly on floor with interior

ramp, and pre-fabricated aluminum floor with heavy duty structural underlayment floor, approximately 5,000 pounds per square feet of load. Where pre-fabricated floor with interior ramp indicated, unit to be finished with “First Choice” vinyl safety flooring provided and installed by Kitchen Equipment Contractor. Where depressed floor indicated, doors, floors, etc. to accommodate concrete-tile finished floors, provided and installed by G.C. after all boxes have been set in place. Walk-in freezers to maintain 0° to "minus" 10° Fahrenheit temperature. Walk-In coolers to maintain 35° to 36° Fahrenheit temperature.

B. Finishes: Unexposed exterior of each unit to be .040 stucco aluminum finishes. All exposed exterior surfaces to be #20 gauge stucco S.S. finish. Interior, except floor, to be .040 stucco white aluminum finish. Floor as noted hereinbefore in spec section 1.51 A.

C. Insulation:

1. Insulation shall be 4" thick rigid urethane foam, foamed-in-place to bond to inner surfaces of metal pans. Urethane foam to have a thermal conductivity (K factor) of not more than 0.118 BTU/hr./sq. ft. per degrees Fahrenheit/inch, and an overall coefficient of heat transfer (U factor) of not more than .029. The "R" factor shall be 34.
2. (Optional) Prefabricated urethane foam panels shall be supplied with a Class 1 fire hazard classification according to ASTM-E-84 as tested by Factory Mutual System. Panels shall have a flame spread rating of 25 or less and a smoke density of no greater than 450°. Every panel shall bear a certifying Factory Mutual label.
3. * These ratings are not intended to reflect hazards presented by this or any other material under actual fire conditions.

D. Doors: Each walk-in shall be equipped with one standard 34"/36" x 78" hinged-type, flush mounted entrance door bearing the UL seal of approval, or of size as indicated on drawing. Each door section consists of a heavy reinforced steel "U" channel frame, foamed-in-place to give extra support and rigidity to the frame and to prevent racking, distortion, warping and twisting. Doors to be #20 gauge S.S. interior and exterior. Door and door panel sections to have 1/8" diamond tread kick plates, 36" high on interior and exterior. Walk-in entrance doors shall be equipped with a one-piece perimeter NSF approved PVC accordion type removable gasket. A magnetic core at top and side shall provide positive seal. An adjustable wiper gasket shall be mounted along the bottom edge of door. Door frames shall be provided with an LED light fixture, pilot light and switch assembly, and concealed wiring. Provide #12 gauge reinforced S.S. threshold and heater wire around the full perimeter (freezer door only). All doors hinged as shown, each with heated 14" x 14" "vision" panel.

E. Standard Hardware: Shall be break-a-way type with cylinder lock and inside safety release handle so door can be opened from the inside even if locked. All latches designed for locking with keyed-alike locks. A positive action hydraulic door closer shall be included to insure gentle closing action of door and insure a positive seal. Hinges shall be cam-lift, self-closing, spring assist with door lift-off capability. Hinges shall be high-pressure zinc die cast with highly polished chrome finish, three per door.

F. Filler Panels: The "exposed" open area of unit at left, right and top at front and sides neatly trimmed with #20 gauge stucco S.S. filler panels to close space between wall and ceiling. Filler panels between top of walk-in box and finished ceiling not to exceed 12" in height. Filler panels equal to exterior of unit. Top panels to be equipped with louvered sections not less than 40% of total square footage of panel (when compressor units are top-mounted).

G. Wall Protection: Two rows of #16 gauge S.S. hat shaped rub rails with concealed fasteners; to be provided and installed at all exposed exterior walls. Top of rub rail to align with top of diamond tread kick plate on door and bottom rub rail to be 10" A.F.F. When corners are exposed, provide 6" x 6" x 60" #12 gauge S.S. corner guard.

H. Lights: Walk-In boxes to be provided with 48" LED light fixtures, Kason model #1810, quantity as shown on plan. The walk-in cooler and freezer to have LED type vapor-proof light, Kason model #1806, with concealed wiring, etc., and toggle switch with pilot light mounted on exterior. Kitchen Equipment Contractor to provide bulbs. It is the responsibility of the Kitchen Equipment Contractor to install light fixtures, provide penetrations in ceiling panels, and seal the penetrations after Electrical Contractor has completed wiring.

I. Sealants: Kitchen Equipment Contractor shall seal all lines, conduits, tubing, wiring, etc., passing through walls and ceiling of walk-in units with high grade caulking compound, then install S.S. escutcheons where required.

J. Alarm System: Each compartment shall be protected by Modularm 75LC system with recessed in panel controls. System provided with wireless communicator, mounted at walk-in units, for connection to building network. System shall provide digital readout of ambient compartment temperature(s). The system shall be located in an area as indicated on the contract documents. It shall require 120/60/1 electrical connection through suitable 1/2" conduit. CAT5 cable connection for activation of remote notification equipment will be provided as part of the alarm system. CAT5 cabling provided and installed by General Contractor. Furnish and install identification labels for operating temperatures as required.

K. Ceiling Support: When split ceilings are required due to ceiling panel span, these ceilings are to be supported by a self-support ceiling structure. The walk-in manufacturer is to provide the ceiling hanger brackets, the steel channels and the bearing steel channels. A detail must be provided on the manufacturer's submittal drawing. Note: When longer spans are required that exceed self-support capability then suspended ceilings are to be provided with manufacturer's detail.

L. Flat Membrane Weather-Proof Roof: Shall be supplied for field installation on top of each walk-in that is located outdoors. Membranes to be fabricated from low-shrink polyester fabric coated with a permanent thermoplastic alloy and have a minimum thickness of 35 mil. Membrane shall be fire retardant, resistant to ultra-violet rays and micro-organisms. Membrane to be white in color to reflect maximum heat load from the sun. Fasteners and trim shall be provided to secure the membrane to the ceiling panels and in cases where walk-in is installed against a building; the membrane roof material will be flashed up the building walls by the equipment installation contractor. The manufacturer's detail must be provided on the submittal drawing.

M. Compressors and Evaporators: Cooler unit, model as indicated on drawings; room air drawn through coil and discharged parallel to ceiling. The coil casing is to be aluminum with a removable drain pan. Drain line from evaporator coil to floor drain as indicated on contract drawings, attached to interior of box with clamps and installed in good, approved, workmanlike manner by Plumbing Contractor. Compressor of the hermetic and/or scroll type, with suction gas cooled motor, designed for operation with approved refrigerant. Unit complete with liquid line drier, shut-off valves, vibration isolators, heat exchanger, dual pressure control and water regulating valve (for water-cooled systems), electrical panel with circuit breaker and magnetic starter. All components and accessories in control box that pertains to the compressor unit only should be factory wired and piped.

For outdoor systems a weather-proof housing, thermostatically controlled crank case heater and low ambient controls for -20°F conditions shall be provided.

Note: Electrical Contractor to provide and install fused disconnect switch where required, as well as conduit and wiring from same to terminals in compressor unit control panel. Also, interconnect conduit and wiring from compressor unit control panel to unit cooler junction box inside walk-in units.

Freezer Unit, model as indicated on drawing, to be electric defrost. The coil casing is to be aluminum with a removable drain pan. Electric heating elements and drain pan heaters. Unit shall include control kit for time initiated temperature terminated defrost plus automatic fan delay. Heat interchanger included. Drain line from evaporator coil to floor drain as indicated on contract drawings, attached to interior of box with clamps and painted to match interior finish; and installed in good, approved, workmanlike manner by Plumbing Contractor. Kitchen Equipment Contractor to install adequate amount of wrap-around, electric heater tape to assure defrosting of drain line, cable lapped not over 1" spacing. Provide Raychem Winter Guard Plus electrical heat tracing model H611050 (type 3), self regulating in temperature, run in parallel, to be designed with a maximum temperature that cannot be surpassed, certified by the manufacturer's representative that the heat trace has been installed and tested in accordance to the manufacturer's specifications. Heater tape connected to electric by Electrical Contractor. After installation and before and after installing the thermal insulation, subject heat to testing using a 2500 VDC megger. Minimum insulation resistance should be 20 megohms regardless of length. The installer shall test for both heating cable bus wires to verify the connection of any splices or tees.

Equipment shall have BTU/hr capacity as indicated on drawing and maintain room temperature of 35° to 36° Fahrenheit, where refrigerator is specified, and 0° to "minus" 10° Fahrenheit, where freezer is specified.

Refrigerant piping to be hard seamless copper tubing, by KEC. Refrigerant lines installed and covered with not less than 1" thick flexible foam plastic insulation applied in accordance with the manufacturer's recommendations. Refrigeration lines to run from compressor location where shown, above the walk-in units. All lines to be tested free from leaks prior to finish of insulated lines. Condensates drain lines outside of walk-in boxes, similarly insulated with 1/2" insulation, by KEC. Each system shall have suction line filters and vibration eliminators field installed.

Thermostatic expansion valves properly sized to handle evaporator loads. Liquid lines shall have moisture indicating sight glass, drier, and shut-off valve field installed.

The temperature in each walk-in box controlled by means of a thermostat wired to actuate a solenoid valve in the liquid lines with the compressor operation controlled by the low pressure cut-out switch. Thermostats and low pressure controls adjusted to maintain room temperatures specified. Each system cleaned and dehydrated by maintaining a vacuum of 500 microns or lower for a minimum period of 5 hours. The vacuum pump used capable of developing a vacuum of 50 microns with its valve in a closed position. The required operating charge of refrigerant and oil shall then be added and each system tested for performance. All refrigerant lines sized for 1 lb. maximum pressure drop.

It is the purpose of the specification to provide a satisfactory refrigeration cycle, therefore, Kitchen Equipment Contractor must include the competent labor and qualified material to provide the owner with an efficient system.

N. Mounting Methods: Compressors, when mounted on building roof, to be provided with adequate dunnage/ curbing by Kitchen Equipment Contractor. Dunnage/ curbing installed by G.C. or roofing contractor. Architect to specify dunnage/ curbing details.

Compressors, when mounted on ceiling of walk-in, to be provided with adequate air circulation, service, access, and vibration isolation.

1.52 NOT USED

PART 2 – PRODUCTS

ITEM #1 RACK, CAN – QTY. AS PER PLAN & SCHEDULE

New Age Industrial Model 1256CK. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Capacity: 216 ea. #10 Cans
- Capacity: 297 ea. #5 Cans
- 1 ea. Premium series rack
- 1 ea. First in-first out type
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Lockwood or Channel Mfg.

ITEM #2 STORAGE SHELVING, 22"W – QTY. AS PER PLAN & SCHEDULE

Fermod Model 6611/R1. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Shelving to be sized to fit
- 5 ea. Shelves with removable, vented inserts
- 4 ea. 84" High uprights
- 1 ea. Tool free shelf adjustment

- Clear corner assemblies where required

Or as manufactured by Metro or Cambro.

ITEM #3 DUNNAGE RACK(S), 22"W – QTY. AS PER PLAN & SCHEDULE

Fermod Model 1R35C12. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- No additional features, options or accessories required

Or as manufactured by Metro or Cambro.

ITEM #4 WALK-IN FREEZER – QTY. AS PER PLAN & SCHEDULE

Thermal Rite Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, Hardwired
- Walk-in Freezer Height stainless: 9'-0" AFF
- Exterior Finish:
  - Stucco Stainless Steel, Exposed Panel(s)
  - Smooth Galvalume, Unexposed Panel(s)
- Interior Finish:
  - White Smooth Galvalume, Walls/ Ceiling Panel(s)
  - Smooth Galvalume, Floor Panel(s)
- Pre-formed panels: 4" Thick, polyurethane insulation
- Pre-formed floor panel: 4" Thick, polyurethane insulation insulated panel depressed in slab, 6 ½" depression
- Interior floor finish: Continuation of kitchen flooring material, as selected by Architect
- Interior / Exterior diamond tread kick plate at door section, foamed in place
- 1 ea. 36" x 78" Door with vision panel
- 1 ea. Flush mount audible temperature/monitoring system alarm
- 1 ea. Evaporator coil limit switch, mounted in interior door frame
- 1 ea. Removable louvered trim panels to ceiling, accessible
- 1 ea. Electrical outlet foamed in panel for Item #6, Air Curtain

Or as manufactured by Kolpak or Norlake.

ITEM #5 REFRIGERATION TO ITEM #4 – QTY. AS PER PLAN & SCHEDULE

RDT Polarcraft Model PCL035ZCT3A with BEL0130. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 208/3, Hardwired, compressor unit
- Electrical: 208/1, Hardwired, evaporator coil
- Refrigeration: R-448A

- Refrigerant line maximum run distance, 100 feet
- 1 ea. Evaporator coils mounted within walk-in box, suspended from ceiling
- 1 ea. Compressor units mounted on building roof
- 1 ea. Dunnage rack, rails or curb for compressor unit
- 1 ea. Weatherproof cowl
- 1 ea. Winterized controls

Or as manufactured by Omni-Temp or ColdZone.

ITEM #6 AIR CURTAIN, UNHEATED – QTY. AS PER PLAN & SCHEDULE

Berner Model CLC08-1036A. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- 1 ea. Stainless steel finish
- 1 ea. Mounting kit
- 1 ea. Aluminum filter kit, washable
- 1 ea. Door limit switch

Or as manufactured by Mars or Curtron.

ITEM #7 SPARE NUMBER

ITEM #8 STORAGE SHELVING, 22"W – QTY. AS PER PLAN & SCHEDULE

Fermod Model 6611/R1. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Shelving to be sized to fit
- 5 ea. Shelves with removable, vented inserts
- 4 ea. 84" High uprights
- 1 ea. Tool free shelf adjustment
- Clear corner assemblies where required

Or as manufactured by Metro or Cambro.

ITEM #9 RACK, PAN – QTY. AS PER PLAN & SCHEDULE

New Age Industrial Model 1331. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Capacity: (20) 18" x 26" Pans
- 1 ea. Pan rack slide base, 3" on center
- 1 ea. Aluminum pan stops
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Lockwood or Channel Mfg.

ITEM #10 WALK-IN COOLER – QTY. AS PER PLAN & SCHEDULE

Thermal Rite Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, Hardwired
- Walk-in Cooler Height: 9'-0" AFF
- Exterior Finish:
  - Stucco Stainless Steel, Exposed Panel(s)
  - Smooth Galvalume, Unexposed Panel(s)
- Interior Finish:
  - White Smooth Galvalume, Walls/ Ceiling Panel(s)
  - Smooth Galvalume, Floor Panel(s)
- Pre-formed panels: 4" Thick, polyurethane insulation
- Pre-formed floor panel: 4" Thick, polyurethane insulated panel depressed in slab, 6 ½" depression
- Interior floor finish: Continuation of kitchen flooring material, as selected by Architect
- Interior / Exterior diamond tread kick plate at door section, foamed in place
- 1 ea. 36" x 78" Door with vision panel
- 1 ea. Flush mount audible temperature/monitoring system alarm
- 1 ea. Evaporator coil limit switch, mounted in interior door frame
- 1 ea. Removable louvered trim panels to ceiling, accessible
- 1 ea. Electrical outlet foamed in panel for Item #6, Air Curtain

Or as manufactured by Kolpak or Norlake.

ITEM #11 REFRIGERATION TO ITEM #10 – QTY. AS PER PLAN & SCHEDULE

RDT Polarcraft Model PCM009ZCT3A with BEL0095. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 208/3, Hardwired, compressor unit
- Electrical: 120/1, Hardwired, evaporator coil
- Refrigeration: R-448A
- Refrigerant line maximum run distance, 100 feet
- 1 ea. Smart Controller, no wiring between compressor/ evaporator
- 1 ea. Evaporator coils mounted within walk-in box, suspended from ceiling
  - 1 ea. Copper drain lines, extended to floor drain, insulated/ heated
- 1 ea. Compressor units mounted on building roof
- 1 ea. Dunnage rack, rails or curb for compressor unit
- 1 ea. Weatherproof cowl
- 1 ea. Winterized controls

Or as manufactured by Omni-Temp or ColdZone.

ITEM #12 FIRE EXTINGUISHER, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

Ansul Model K-CLASS. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- 1 ea. Wet chemical type, Ansulex low pH agent
- 1 ea. 2.5 Gallon tank
- 1 ea. Wall bracket
- 1 ea. Rechargeable
- Wall backing by General Contractor

Or as manufactured by Captive Aire or Kidde.

ITEM #13 HAND SINK, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model WS-1D. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- 1 ea. Manual faucet, gooseneck
- 1 ea. Soap dispenser, owner supplied
- 1 ea. Towel dispenser, owner supplied
- 1 ea. Left and right splash guards
- Wall backing by General Contractor

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #14 SPARE NUMBER

ITEM #15 HOSE REEL WITH GUN – QTY. AS PER PLAN & SCHEDULE

T&S Brass Model B-7132-05. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- 1 ea. 35' hose length
- 1 ea. Spray gun assembly
- 1 ea. Exposed reel
- 1 ea. Hose reel connector kit
- All necessary components for full operation

Or as manufactured by Fisher or Component Hardware.

ITEM #16 EYE WASH STATION, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

Guardian Model G1750P. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- 1 ea. Thermostatic mixing valve, TMVG3600LF
- 1 ea. ANSI Compliant identification sign
- Wall backing by General Contractor

Or as manufactured by T&S Brass or Component Hardware.

ITEM #17 FILTER SYSTEM FOR ITEM #19/20 – QTY. AS PER PLAN & SCHEDULE

3M Purification Model SGLP200-CL-BP. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- For use with Item #19/#20, Combination Oven-Steamers
- 1 ea. RO storage tank
- 1 ea. Integrated pump
- 1 ea. Steel mounting bracket
- 1 ea. Certified factory install

Or as manufactured by Antunes or Everpure.

ITEM #18 S.S. WALL PANEL(S), 204"L – QTY. AS PER PLAN & SCHEDULE

Captive Aire Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Stainless steel panels, evenly sized, 20 Gauge
- Installed from top of coved base to underside of hood, entire length
- Hairline joints sealed with S.S. trim strips
- Secured to wall with heat resistant mastic

It is the responsibility of the Kitchen Equipment Contractor to coordinate and make all appropriate cut-outs in paneling based on utility requirements in this location and apply appropriate stainless steel trim strips, caps, gussets, etc…

Or as manufactured by Accurex or Caddy.

ITEM #19 OVEN-STEAMER, COMBI, GAS – QTY. AS PER PLAN & SCHEDULE

Rational Model ICP-6 FULL NG. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 208/1, NEMA 6-15P
- Gas: 3/4" Rear Connection, 107 MBtuh
- 1 ea. iCookingControl with 7 modes, per cavity
- 1 ea. (6) 18"x26" or (12) 12"x20" pan capacity, per cavity
- 1 ea. Core temp probe with 6 point measurement, per cavity
- 1 ea. Hand shower with automatic retracting system, per cavity
- 3 ea. Grid shelves, per cavity
- 1 ea. Ethernet interface, per cavity
- 1 ea. Installation Kit for gas units
- 1 ea. Combi-Duo Stacking Kit with casters
- 1 ea. Right hinged doors, per cavity
- 1 ea. Set of appliance locating device, POSI-SET
- 1 ea. Certified installation/ Start-up
- Cold water connection piped from Filter System, Item #17

Or as manufactured by Convotherm or Alto-Shaam.

ITEM #20 OVEN-STEAMER, COMBI, GAS – QTY. AS PER PLAN & SCHEDULE

Rational Model ICP-6 FULL NG. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 208/1, NEMA 6-15P
- Gas: 3/4" Rear Connection, 107 MBtuh
- 1 ea. iCookingControl with 7 modes, per cavity
- 1 ea. (6) 18"x26" or (12) 12"x20" pan capacity, per cavity
- 1 ea. Core temp probe with 6 point measurement, per cavity
- 1 ea. Hand shower with automatic retracting system, per cavity
- 3 ea. Grid shelves, per cavity
- 1 ea. Ethernet interface, per cavity
- 1 ea. Installation Kit for gas units
- 1 ea. Right hinged doors, per cavity
- 1 ea. Set of appliance locating device, POSI-SET
- 1 ea. Certified installation/ Start-up
- Cold water connection piped from Filter System, Item #17

Or as manufactured by Convotherm or Alto-Shaam.

ITEM #21 SPARE NUMBER

ITEM #22 OVEN, CONVECTION, GAS – QTY. AS PER PLAN & SCHEDULE

Garland Model MCO-GS-20-S. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Electrical: 120/1, NEMA 5-15P
- Gas: 3/4" Rear Connection, 120 MBtuh
- Manifold gas line for double unit
- 1 ea. Pressure regulator
- 1 ea. Electronic ignition
- 1 ea. Solid state controls
- 1 ea. Stainless steel exterior bottom
- 1 ea. Stainless steel back enclosure, top/bottom
- 1 ea. Extra oven racks
- 1 ea. 48" Quick disconnect with flexible hose
- 1 ea. Restraint cable
- 1 ea. American Gas Association (AGA) compliant
- Energy Star® Certified
- 1 ea. Set of appliance locating device, POSI-SET
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Southbend or American Range.

ITEM #23 FLOOR TROUGH – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model FT-2430-SG. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- 1 ea. NSF Approved
- 1 ea. Standard 4" depth
- 1 ea. Fibergrate style Micromesh, removable grate, ADA type, gridded fiberglass

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #24 KETTLE, STEAM JACKETED – QTY. AS PER PLAN & SCHEDULE

Cleveland Range Model KGL-40-T. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Gas: 3/4" Rear Connection, 140 MBtuh
- 1 ea. Pressure regulator
- 1 ea. Electronic spark ignition
- 1 ea. Tilting kettle accessory kit
- 1 ea. Tangent draw-off assembly, TD2A45
- 1 ea. Power lift
- 1 ea. Double pantry faucet, DPKT
- 1 ea. Kettle markings, 5 gallon increments
- 1 ea. 316 Stainless steel liner
- 1 ea. Lift off cover, CL40
- 1 ea. Descaling solution
- 1 ea. 48" quick disconnect with flexible hose
- 1 ea. Restraint cable

Or as manufactured by Groen or Crown.

ITEM #25 RANGE, HEAVY DUTY, GAS – QTY. AS PER PLAN & SCHEDULE

Garland Model MST44R-E. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Gas: 3/4" Rear Connection, 184 MBtuh
- 1 ea. Pressure regulator
- 1 ea. Electronic spark ignition
- 1 ea. 24" High stainless steel riser with 12" W x 34" L tubular overshelf
- 1 ea. 48" Quick disconnect with flexible hose
- 1 ea. Restraint cable
- 1 ea. Set of appliance locating device, POSI-SET
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Southbend or American Range.

ITEM #26 EXHAUST HOOD, TYPE I – QTY. AS PER PLAN & SCHEDULE

Captive Aire Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Construction: 100% 430 stainless steel
- Filters: Stainless steel captrate solo with hook
- Insulation: Integral air/ insulation barriers at perimeter and top, 0" clearance to combustibles
- Structural front panel, insulated
- Wall / Island canopy hood, length/ size as per contract documents
- 2 ea. Front perforated supply plenum (PSP) with built-in 3" back standoff
- Insulation for PSP housing, as required
- 4 ea. LED lights, round recessed
- Stainless steel field wrap, approximately 18" high on all exposed sides
- Adjustable exhaust air volume control damper
- Hood Control Panel Package:
    - EMSplus11 modulating energy management system with smart controls
    - Built-in VFDs
    - Duct Temperature Sensors in all risers
    - Room Temperature Sensor
    - Configurable through Touch Screen Interface
    - EMS Duct Thermostat
    - INVERTER DUTY THREE PHASE MOTORS REQUIRED

Or as manufactured by Caddy or Accurex.

ITEM #27 SUPPLY PLENUM, MAKE-UP AIR – QTY. AS PER PLAN & SCHEDULE

Captive Aire Model Custom. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Included as part of Item #26, Exhaust Hood

Or as manufactured by Caddy or Accurex.

ITEM #28 SPARE NUMBER

ITEM #29 EXHAUST HOOD, CONTROL PANEL – QTY. AS PER PLAN & SCHEDULE

Captive Aire Model Custom. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Included as part of Item #26, Exhaust Hood

Or as manufactured by Caddy or Accurex.

ITEM #30 FIRE PROTECTION SYSTEM – QTY. AS PER PLAN & SCHEDULE

Captive Aire Model UL-300 (R-102). Unit to be installed where shown on drawing in strict accordance to that described in General Specifications. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, Hardwired
- Provide connection to building Fire Alarm System
- 1 ea. Gas valve, up to 3", size to be verified
- 1 ea. Reset Relay Push Button
- For the protection of equipment beneath Exhaust Hood, Item #26

Or as manufactured by Caddy or Accurex.

ITEM #31 ADA HAND SINK, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model ADA-WS-1D. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- ADA Compliant
- 1 ea. Manual faucet, gooseneck
- 1 ea. Soap dispenser, deck mounted
- 1 ea. Towel dispenser, integral C-fold
- 1 ea. Left and right splash guards
- Wall backing by General Contractor

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #32 3-COMPARTMENT SINK, POTWASH – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model SCS-34-2028-24RL. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- 3 ea. Built-in work sinks, 28" L x 20" W x 14" D
- 3 ea. Waste valve with lever
- 3 ea. Tail piece
- 3 ea. Waste overflow
- 1 ea. Stainless steel pre-rinse assembly with 12" swing spout add-on faucet and wrist action handles, 1/2" connections
- 1 ea. Stainless steel faucet with 12" swing spout and wrist action handles, 1/2" connections
- 1 ea. Stainless steel common bowl skirt
- Flanged feet, adjustable

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #33 S.S. REMOV. RACK GUIDE – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model Custom. Size, shape and installed where shown on drawing. This is a fabricated Item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- 1 ea. Removable rack guide to fit over sink, Stainless Steel, 12 Gauge
- 1 ea. Integral bracket, undercounter, to hold when not in use

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #34 STORAGE SYSTEM, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

Eagle Group/Metal Masters Model WAL-STOR. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Mounting Height: 50" above finished floor
- 2 ea. Wall grid/mat, WM1860-E, stacked
- 1 ea. Wall uprights, vertical, PR45VU-E
- 2 ea. Shelf, 1448-E
- 2 ea. Shelf Brackets, PR14B-E
- 1 ea. Grid Shelf, 1436WGS-E
- 2 ea. Baskets, WB-E
- 12 ea. Utility Hooks, UH-E
- 1 ea. Epoxy coated finish, entire wall system
- Wall backing by General Contractor

Or as manufactured by Focus or Metro.

ITEM #35 SPARE NUMBER

ITEM #36 DOOR-TYPE WAREWASHER, VENTLESS – QTY. AS PER PLAN & SCHEDULE

Champion Model DH6000T-VHR. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 208/3, Hardwired, Machine
- Electrical: 120/1, NEMA 5-15P, drain tempering kit
- 1 ea. Single point electrical connection
- 1 ea. Corner design application
- 6 ea. Peg racks
- 6 ea. All purpose racks
- 6 ea. Vollrath Traex sheet pan racks, TR23
- 1 ea. Built-in hot water booster, 70° rise
- 1 ea. Detergent/rinse aid pumps, built-in
- 1 ea. Drain tempering kit
- 1 ea. High/ tall chamber
- Flanged feet bolted to floor

Or as manufactured by Hobart or Meiko.

ITEM #37 CLEAN DISH TABLE – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model SCDT-96. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Stainless steel tubular crossrails, side/ rear
- Flanged feet, adjustable

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #38 RACK SHELF, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

New Age Model 52924. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Capacity: (13) 20" x 20" Racks
- Mounting height: 56" above finished floor
- 1 ea. Vertical storage, 4-1/2" centers
- Wall backing by General Contractor

Or as manufactured by Channel Mfg. or Lockwood.

ITEM #39 REFRIGERATOR, PASS-THRU – QTY. AS PER PLAN & SCHEDULE

Utility Refrigerator Model PT-R-30-SS-2S-2S-D. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Verify door hinging
- Exterior Finish: Stainless Steel
- Interior Finish: Stainless Steel
- 1 ea. Self-contained refrigeration
- 4 ea. Half height solid door(s) with locks, pass-thru model
- 1 ea. Thermal expansion valve
- 1 ea. Receiver tank with service valves
- 1 ea. Sight glass
- 1 ea. Filter drier
- 1 ea. Low pressure cutout
- 1 ea. Digital temperature control system
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Traulsen or Victory.

ITEM #40 ADA WORK TABLE W/ SINK – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model Custom. Size, shape, and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Electrical: 120/1, NEMA 5-15R
- 1 ea. GFCI duplex receptacles mounted in splash, S.S. cover plates
- ADA Compliant clearance 30" L x 19" W x 27" H
- 1 ea. Built-in work sink, tapered, 20" L x 16" W x 6" D each
- 1 ea. S.S. Removable sink bowl cover
    - Stainless steel, 14 Gauge
    - Finger holes, lift-off
    - Flush inlay with work sink/top
    - Integral bracket, under counter, to hold when not in use
- 1 ea. Rear / off-set drain connection
- 1 ea. Waste valve with lever
- 1 ea. Stainless steel faucet with 12" swing spout and wrist action handles, 1/2" connections
- 1 ea. Work drawer assembly with removable cutting board
- Stainless steel undershelf, removable
- Flanged feet, adjustable

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #41 OVERSHELF, SPLASH MNTD. – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model TBV-1-12102. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Mounting height: 56" above finished floor
- 1 ea. Single tier
- 1 ea. Rear splash/ upturn
- 1 ea. Left/right splash/ upturn

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #42 SPARE NUMBER

ITEM #43 WORK TABLE W/ SINK – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Electrical: 120/1, NEMA 5-15R

- 1 ea. GFCI duplex receptacles mounted in splash, S.S. cover plates
- 1 ea. Built-in work sink, 20" L x 16" W x 12" D each
- 1 ea. S.S. Removable sink bowl cover
    - Stainless steel, 14 Gauge
    - Finger holes, lift-off
    - Flush inlay with work sink/top
    - Integral bracket, under counter, to hold when not in use
- 1 ea. Waste valve with lever
- 1 ea. Tail piece
- 1 ea. Waste overflow
- 1 ea. Stainless steel faucet with 12" swing spout and wrist action handles, 1/2" connections
- 1 ea. Work drawer assembly with removable cutting board
- Stainless steel undershelf, removable
- Flanged feet, adjustable

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #44 OVERSHELF, SPLASH MNTD. – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model TBV-1-1251. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Mounting height: 56" above finished floor
- 1 ea. Single tier
- 1 ea. Rear splash/ upturn
- 1 ea. Left/right splash/ upturn

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #45 SLICER, FOOD – QTY. AS PER PLAN & SCHEDULE

Globe Model G12A. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- 1 ea. Automatic type
- 1 ea. Lift device

Or as manufactured by Bizerba or Berkel.

ITEM #46 WORK TABLE – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Electrical: 120/1, NEMA 5-15R

- 2 ea. GFCI duplex receptacles mounted in splash, S.S. cover plates
- 2 ea. Work drawer assembly with removable cutting board
- Stainless steel undershelf, removable
- Flanged feet, adjustable

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #47 OVERSHELF, SPLASH MNTD. – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model TBV-1-12102. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Mounting height: 56" above finished floor
- 1 ea. Single tier
- 1 ea. Rear splash/ upturn
- 1 ea. Left/right splash/ upturn

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #48 2-COMPARTMENT, PREP. TABLE – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Electrical: 120/1, NEMA 5-15R
- 2 ea. GFCI duplex receptacles mounted in splash, S.S. cover plates
- 2 ea. Built-in work sinks, 24" L x 18" W x 12" D
- 2 ea. S.S. Removable sink bowl covers
    - Stainless steel, 14 Gauge
    - Finger holes, lift-off
    - Flush inlay with work sinks/tops
    - Integral bracket, under counter, to hold when not in use
- 2 ea. Waste valve with lever
- 2 ea. Tail piece
- 2 ea. Waste overflow
- 1 ea. Stainless steel faucet with 12" swing spout and wrist action handles, 1/2" connections
- 1 ea. Stainless steel common bowl skirt
- Stainless steel undershelf, removable
- Flanged feet, adjustable

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #49 SPARE NUMBER

ITEM #50 OVERSHELF, SPLASH MNTD. – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model TBV-1-1251. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Mounting height: 56" above finished floor
- 1 ea. Single tier
- 1 ea. Rear splash/ upturn
- 1 ea. Left/right splash/ upturn

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #51 REFRIGERATOR, PASS-THRU – QTY. AS PER PLAN & SCHEDULE

Utility Refrigerator Model PT-R-30-SS-2S-2S-D. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Verify door hinging
- Exterior Finish: Stainless Steel
- Interior Finish: Stainless Steel
- 1 ea. Self-contained refrigeration
- 4 ea. Half height solid door(s) with locks, pass-thru model
- 1 ea. Thermal expansion valve
- 1 ea. Receiver tank with service valves
- 1 ea. Sight glass
- 1 ea. Filter drier
- 1 ea. Low pressure cutout
- 1 ea. Digital temperature control system
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Traulsen or Victory.

ITEM #52 CABINET, HEATED, ROLL-THRU – QTY. AS PER PLAN & SCHEDULE

Utility Refrigerator Model RTHC-30-SS-1S-1S-H. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-20P
- Verify door hinging
- Exterior Finish: Stainless Steel
- Interior Finish: Stainless Steel
- 2 ea. Entrance ramp
- 2 ea. Full solid door(s) with locks, roll-thru model
- 1 ea. Digital temperature control system
- 1 ea. High limit switch, manual reset

Or as manufactured by Traulsen or Victory.

ITEM #53 REFRIGERATOR, ROLL-THRU – QTY. AS PER PLAN & SCHEDULE

Utility Refrigerator Model RTR-30-SS-1S-1S-H. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Verify door hinging
- Exterior Finish: Stainless Steel
- Interior Finish: Stainless Steel
- 1 ea. Self-contained refrigeration
- 2 ea. Entrance ramp
- 2 ea. Full solid door(s) with locks, roll-thru model
- 1 ea. Thermal expansion valve
- 1 ea. Receiver tank with service valves
- 1 ea. Sight glass
- 1 ea. Filter drier
- 1 ea. Low pressure cutout
- 1 ea. Digital temperature control system

Or as manufactured Traulsen or Victory.

ITEM #54 WORK COUNTER, STORAGE BASE – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Cabinet/Door to be flush frame design
- Stainless steel integrated handles, horizontal orientation
- Cylinder locks, keyed alike, as required
- Intermediate stainless steel solid shelves, adjustable
- Stainless steel legs, 6" adjustable

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #55 WORK COUNTER, STORAGE BASE – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Cabinet/Door to be flush frame design
- Stainless steel integrated handles, horizontal orientation
- Cylinder locks, keyed alike, as required
- Intermediate stainless steel solid shelves, adjustable
- Stainless steel legs, 6" adjustable

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #56 SPARE NUMBER

ITEM #57 HAND SINK, BUILT-IN – QTY. AS PER PLAN & SCHEDULE

IMC/ Teddy Model Custom. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- 1 ea. Manual faucet
- 1 ea. Built-in hand sink, 12" L x 10" W x 7" D, tapered
- 1 ea. Soap dispenser, Component Hardware Model KS10-1000
- 1 ea. Integral towel dispenser, C-fold
- 1 ea. Integral raised stainless steel splashes, perimeter
- 1 ea. Stainless steel faucet with 6" swing spout and wrist action handles, 1/2" connections
- 1 ea. Rear / off-set drain connection

Or as manufactured by John Boos & Co. or Eagle Group/Metal Masters.

ITEM #58 POT/ PAN RACK, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Metro Model PR48VX3. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- 4 ea. 24" x 48" shelves with removable, vented inserts
- 4 ea. 74" high uprights
- 1 ea. Cutting board/tray drying rack, MTR2448XEA
- 2 ea. Drop-in Rack, DR48S
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Eagle Group/Metal Masters or Cambro.

ITEM #59 MILK COOLER – QTY. AS PER PLAN & SCHEDULE

True Mfg. Model TMC-49-S-SS-HC. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Crate Capacity: (16) 13" x 13" x 11-1/8"
- Exterior Finish: Stainless Steel
- Interior Finish: Stainless Steel
- 1 ea. Self-contained, air-cooled
- 1 ea. Single-sided operation
- 1 ea. Stainless steel drop front/ hold-open flip up lid with lock
- 3 ea. Heavy-duty floor racks
- 1 ea. Digital thermometer
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Traulsen or Victory.

ITEM #60 HOT FOOD COUNTER – QTY. AS PER PLAN & SCHEDULE

LTI Model SIM-TW-4-60. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Electrical: 208/1, NEMA 6-15P
- Front Panels: WilsonArt, Premium Collection, as selected by Architect
- End Panels: WilsonArt, Premium Collection, as selected by Architect
- Counter Heights: 34" Counter Top
- 1 ea. 4-Well hot pan
- 1 ea. 6" Stainless steel cutting board, fold down
- 1 ea. Interlocking device
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Piper Products or Delfield.

ITEM #61 FOOD PROTECTOR(S), ADJUSTABLE – QTY. AS PER PLAN & SCHEDULE

Premier Metal & Glass Model TM2N-A. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, Hardwired
- Gearless adjustment brackets
- LED Strip lights mounted to posts, concealed wiring
- LED Light mounting clips for extended lengths, as required
- 1" Tubular stainless steel posts
- Extend 20" above counter top, overall height
- Anchored below to counter frame for rigidity
- Stainless steel sleeve post extends thru counter top
- 3/8" Tempered glass, horizontal/vertical surfaces

Or as manufactured by Versa-Gard or FlexiShield.

ITEM #62 FLAT TOP COUNTER – QTY. AS PER PLAN & SCHEDULE

LTI Model SIM-ST-28. Size, shape and installed where shown on drawing. This is a fabricated Item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Electrical: 120/1, NEMA 5-15R
- Front Panels: WilsonArt, Premium Collection, as selected by Architect
- End Panels: WilsonArt, Premium Collection, as selected by Architect
- Counter Heights: 34" Counter Top

- 1 ea. Open under storage with shelf
- 1 ea. Interlocking device
- 1 ea. Cord/plug assembly
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Piper Products or Delfield.

ITEM #63 SPARE NUMBER

ITEM #64 COLD FOOD COUNTER – QTY. AS PER PLAN & SCHEDULE

LTI Model SIM-TA-60. Size, shape and installed where shown on drawing. This is a fabricated Item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Electrical: 120/1, NEMA 5-15P
- Front Panels: WilsonArt, Premium Collection, as selected by Architect
- End Panels: WilsonArt, Premium Collection, as selected by Architect
- Counter Heights: 34" Counter Top
- 1 ea. 4-Well cold pan
- 1 ea. 6" Stainless steel cutting board, fold down
- 1 ea. Interlocking device
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Piper Products or Delfield.

ITEM #65 FOOD PROTECTOR(S), ADJUSTABLE – QTY. AS PER PLAN & SCHEDULE

Premier Metal & Glass Model TM2N-A. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, Hardwired
- Gearless adjustment brackets
- LED Strip lights mounted to posts, concealed wiring
- LED Light mounting clips for extended lengths, as required
- 1" Tubular stainless steel posts
- Extend 20" above counter top, overall height
- Anchored below to counter frame for rigidity
- Stainless steel sleeve post extends thru counter top
- 3/8" Tempered glass, horizontal/vertical surfaces

Or as manufactured by Versa-Gard or FlexiShield

ITEM #66 FLAT TOP COUNTER – QTY. AS PER PLAN & SCHEDULE

LTI Model SIM-ST-28. Size, shape and installed where shown on drawing. This is a fabricated Item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Front Panels: WilsonArt, Premium Collection, as selected by Architect
- End Panels: WilsonArt, Premium Collection, as selected by Architect
- Counter Heights: 34" Counter Top
- 1 ea. Open under storage with shelf
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Piper Products or Delfield.

ITEM #67 CASHIER COUNTER – QTY. AS PER PLAN & SCHEDULE

LTI Model SIM-CSE-28. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- Electrical: 120/1, NEMA 5-15R
- Front Panels: WilsonArt, Premium Collection, as selected by Architect
- End Panels: WilsonArt, Premium Collection, as selected by Architect
- Counter Heights: 34" Counter Top
- 1 ea. Stainless steel tubular foot rest
- 1 ea. Duplex receptacle mounted in panel, S.S. cover plates
- 1 ea. Data/Network port, mounted in panel
- 1 ea. Cord/plug assembly
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Piper Products or Delfield.

ITEM #68 NOVELTY CASE, ICE CREAM – QTY. AS PER PLAN & SCHEDULE

Beverage Air Model NC43-1-W. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- 1 ea. Self-contained refrigeration
- 2 ea. Glass lids, sliding
- 4 ea. Removable baskets
- 1 ea. Adjustable thermostat control
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Kelvinator or Master-Bilt.

ITEM #69 TRAY SLIDE, V-RIBBED, 9"W – QTY. AS PER PLAN & SCHEDULE

LTI Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Construction: 100% 304 Stainless Steel
- 1 ea. 16 GA. Stainless steel
- 1 ea. Inverted "V" style runners, (3) row
- 1 ea. Flat/ tapered edge, perimeter

Or as manufactured by Piper Products or Delfield.

ITEM #70 SPARE NUMBER

PART 3 - EXECUTION

3.1 GENERAL RELATED CONDITIONS

A. In each item of equipment hereinafter specified under the "Equipment Schedule," these specifications shall only identify each respective item by name and model number, as well as list various component parts/ accessories provided for same.

B. Therefore, it shall be intended that these respective items and their component parts shall be of material (mounted where applicable) constructed and furnished in strict accordance to that described in the general specifications for these items and integrally constructed where applicable.

C. It shall also be intended that where buy-out (pre-fabricated) items are specified, same shall be definitely furnished with all the accessories as normally furnished by manufacturer for these items. Also in strict accordance with current manufacturer's engineering data sheet for each respective item.

D. Should no list or description be provided for various component parts/ accessories, the Kitchen Equipment Contractor is responsible to provide required components for full and proper operation of said equipment.

3.2 EXAMINATION OF PLANS AND SPECIFICATIONS

A. Prospective bidders for this work must examine these plans and specifications carefully before bidding, and must request from Architect and/or Food Service Consultant in writing for an interpretation or correction of every apparent ambiguity, inconsistency or error therein. If necessary, such interpretation or correction shall be issued in writing as an addendum.

3.3 SPECIAL NOTES

A. It shall be the responsibility of Kitchen Equipment Contractor to make as many visits to the job site as is necessary and to keep up to date with progress made in field on the installation of all necessary rough-in to adequately and properly operate and accommodate all equipment furnished by said Contractor and as shown on drawings. Include this service in bid.

B. Kitchen Equipment Contractor to cooperate with all trades so that the end results of his/her work will be a satisfactory, approved and accepted installation. Written reports of each visit shall be sent promptly to the Architect and/or Food Service Consultant.

3.4 COORDINATION

A. Procedure of construction is of paramount importance in executions of this project. Kitchen Equipment Contractor to carry on his/her work so that no delay in his/her operations or those of any other contractors occurs at any time.

B. Kitchen Equipment Contractor to verify with Architect and/or Food Service Consultant as to opening date of the food service area(s), and schedule his/her fabrication and purchasing of equipment so that all will

be in readiness, installed, connected, tested, demonstrated, etc., in ample time prior to the scheduled opening date.

3.5 DELIVERY AND INSTALLATION

A. Shall mean and intend that Kitchen Equipment Contractor shall deliver and assemble all equipment of contract in 1 piece in required locations in building, ready for water, waste, gas, electric and ventilating connections required by other trades.

B. Any pieces of equipment may be delivered sectionally, but all working surfaces butt-welded, ground and polished on premises so that upon completion, such item of equipment will have true, smooth, even and continuous surfaces. Butt joining and filling with solder not permitted.

C. Kitchen Equipment Contractor must verify door sizes, delivery platform, elevator size, etc., effecting delivery to food service area(s) for all items of equipment.

3.6 RESERVATIONS AND CONDITIONS

A. It is the intent of this specification to complete the installation of all equipment covered herein in all phases ready for operation. Contractor shall carefully examine the plans and specifications for building construction contracts and determine therefrom the extent of his operations in all respects. All labor and materials not included in building construction contracts necessary to accomplish this intent are hereby included in this contract.

B. Kitchen Equipment Contractor shall attend job meetings when required for purpose of coordinating his/her work with other trades.

C. All equipment shall be received at the building fully protected. It will be the responsibility of the Kitchen Equipment Contractor to protect the equipment until completely installed and accepted.

3.7 NOT USED

END OF SECTION

SECTION 11 5213
PROJECTION SCREENS AND MOUNTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Front projection screen assemblies.

B. Projector mount.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking in walls and ceilings.

B. Section 09 5100 - Acoustical Ceilings: Suspended panel ceilings for recessed screens.

1.4 REFERENCES

A. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

B. Cradle to Cradle Certified - Cradle to Cradle Products Innovation Institute.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: For installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.

D. Samples: For screen fabrics, submit two samples 6 by 6 inch (152 by 152 mm) in size.

E. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Brewster Central School District's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Experienced in manufacturing products with minimum of ten (10) years experience in the fabrication of projection screen specified in this section.

B. Installer Qualifications: Experienced in installation of the work of this section with minimum of five (5) years .

C. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements and manufacturer’s instructions. Comply with Section 01 3000 - Administrative Requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F (10 degrees C), and stack in accordance with manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

1.8 FIELD CONDITIONS

A. Maintain interior of building between 60 degrees F (15 degrees C) and 75 degrees F (24 degrees C) during and after installation of projection screens.

1.9 COORDINATION

A. Coordinate work with installation of stage curtains and rigging, electric service power characteristics, and location.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide two (2) year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Draper Inc; Basis of Design Screen

2.2 FRONT PROJECTION SCREENS

A. Manufacturers:
   1. Draper, Inc (Motorized); Paragon:Series V www.draperinc.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Front Projection Screens: Factory assembled unless otherwise indicated.
   1. In Cafetorium: Motorized, matte light diffusing fabric screen, horizontally tensioned, ceiling recessed.
      a. Screen Viewing Area: 160" x 284"

C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
   1. Material: Matte white vinyl on fiberglass backing, with nominal gain of 1.0 over viewing angle not less than 70 degrees from axis, horizontally and vertically.
   2. Seams: No seams permitted in fabric up to 96 inch (2438 mm) high by 72 inch (1829 mm) wide.

D. Masking Borders: Black, on four sides.

E. Maintain interior of building between 60 degrees F (15 degrees C) and 75 degrees F (24 degrees C) during and after installation of projection screens.

F. Concealed-in-Ceiling Screen Cases: Steel, with integral roller brackets.
   1. Door Slat: Self trim; self-closing and -opening.
   2. Case Finish: Baked enamel.
   3. Case Color: Black.
   4. End Caps: Steel; finished to match case.
   5. Electrically-Operated Screens: 6 inch (__ mm) 1/8" thick steel door roller.

G. Electrically-Operated Screens:
   1. Paragon/Series V: Large electrically operated, tab tensioned, extruded aluminum case. Projection screen with motor in roller. Case fully enclosed except for slot allowing viewing surface passage. Roller: 6 inches (152 mm) diameter steel tube. Viewing surface securely attached to roller at top and at bottom to weighted dowel. Provided with universal mounting brackets for attachments to structure above.
   2. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
   3. Motor Screen Controls, UL certified.
      a. Key operated 3-position control switch rated 115V AC, 60 Hz to stop or reverse screen at any point.

b. Power supply key switch

4. Projection Viewing Surface:
   a. Matt White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Children and Schools certified.
   b. Tab-Tensioning System.
      a) Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Warranted for 5 years against tab separation. Viewing surface inserted into aluminum bottom dowel.
   c. Provide an extra screen drop with an overall screen drop of one foot with a black masking top border.
5. Roller: Steel, 6 inch (- mm) in diameter, with locking device.
6. Vertical Tensioning: Screen fabric weighted at bottom with steel bar and plastic end caps.
7. Horizontal Tensioning: Tab-guided cable system.

2.3 PROJECTOR MOUNT

A. MANUFACTURERS:
   1. Epson America, Inc.; Los Alamitos, CA
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. COMPONENTS:
   1. Product: High Ceiling Mount, ELPMB48
   2. Model: V12H803010
   3. Dimensions: 16.9"x15.7"x13"
   4. Wieght: 165 lbs.
   5. Electrical: See manufacturer requirements.

2.4 PROJECTOR

A. MANUFACTURERS (Basis of Design)
   1. RICOH USA, Inc
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. COMPONENTS:
   1. Product: Ricoh PJ WUL6690

2.5 ELECTRICAL COMPONENTS (SCREEN)

A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Motors: Direct drive, 110 V, 60 Hz.
   1. Door and Adjustable Masking Motor: Mounted inside roller; three wire with ground; quick reverse type; equipped with thermal overload cut-off.
      a. Electrical Characteristics: 1.2 amps.

C. Controls: Three (3) position control switch with plate.
   1. Provide two control stations to screen, with internal override to prevent more than one signal reaching the screen.
   2. Remote Control: Infrared; provide one transmitter.
   3. Security: Provide key operated switch; provide 2 keys.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that openings for recessed screens are correctly sized.

D. Verify type and location of electrical connections.

E. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.2 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

C. Provide supplemental steel supprts as required to support, screen/enclosure, projector and projector mount. Anchor supplemental steel to the steel structure. Paint to match adjacent structure.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and as indicated on drawings.

D. Install plumb and level.

E. Install electrically operated screens and mounts and projectors ready for connection to power and control systems by others.

F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

G. Test electrically operated units to verify that screen, controls, limit switches, closure and other operating components are in optimum functioning condition.

3.4 FIELD QUALITY CONTROL

A. Manufacturer’s Field Services: Have manufacturer’s technical representative schedule site visits to review work as follows:
   1. 2 times during progress of work at 25% and completion.
   2. Upon completion of work, after cleaning is carried out.

B. Testing and Inspection: Operate each screen [3] times to ensure viewing surfaces extend and retract through full range of motion.
   1. Verify controls, limit switches, [automatic doors] and other components function as designed and meet project requirements.
   2. Ensure viewing surface raising operation fully engages and lifts screen closure door into closed position.
   3. Adjust motors, controls and components to allow for smooth, unobstructed screen operation

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 6143
STAGE CURTAINS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Stage curtain fabrics.

B. Linings.

C. Stage curtain track support systems.

1.2 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

B. FM (AG) - FM Approval Guide; current edition.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

E. UL (DIR) - Online Certifications Directory; Current Edition.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for each type of product as follows:

C. Shop Drawings: Indicate installation information for components not dimensioned or detailed in product data.

1. Submit floor plans, elevations, sections, attachment details of curtains and operating clearances.
2. Submit fabric assembly and support details.
3. Submit documentation indicating load capacity of each batten, track, attachment, and rigging components.
4. Submit attachment locations for Front curtain panel, front masking legs, front valance panel, side curtain panels, rear curtain panels and masking border panel., and corresponding loads imposed on structure.

D. Selection Samples: Submit color chart for each type of stage curtain indicated that includes full range of colors, textures, and patterns available, along with 12-inch (305 mm) square fabric sample, in any color, of each fabric type and seam.

E. Verification Samples: Submit fabric full width by at least 12-inch (305 mm) long section of each selected fabric from dye lot to be used for this work, with specified treatments applied and showing repeat of patterns; mark top and face of fabric.

F. Certificate: Certify that products of this section meet or exceed specified requirements.

G. Delegated Design Data: Indicate stage curtain system structural attachments, including analysis data signed and sealed by qualified designer responsible for their preparation.

H. Designer's Qualification Statement.

I. Installer's Qualification Statement.

J. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Brewster Central School District's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Perform design of track support system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in New York.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.6 FIELD CONDITIONS

A. Ambient Conditions: Do not install stage curtains until spaces are fully enclosed and watertight, and the following:
   1. Wet work in adjacent areas is complete and surfaces are dry.
   2. Work at and above ceiling level has been completed.
   3. Ambient temperatures and humidity of adjacent areas are maintained at levels when occupied for intended use.

B. Field Measurements: Confirm supporting structural element locations and adjacent construction for stage curtains and rigging, and complete field measurements prior to fabrication and include these dimensions on shop drawings.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Defective Work includes, but is not limited to, stage curtain support and rigging that is not operating properly.

PART 2 PRODUCTS

2.1 MANUFACTURERS (Basis of Design)

A. Stage Curtain Fabrics:
   1. Fred Krieger & Company: www.fredkriegerfabrics.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Stage Curtain Track Systems:
   1. Fred Krieger & Company: www.fredkriegerfabrics.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Stage Curtain Systems Design: Engage qualified designer to develop design of stage curtain system, including comprehensive project specific analysis of necessary structural system attachments in compliance with performance requirements.

B. Structural Performance: Ensure attachment of stage curtain system to structure withstands material weight and operational loads applicable for this project and in compliance with local building codes and authorities having jurisdiction.
   1. Design Loads: Weight of stage curtains and track system.

C. Fire-Test Characteristics: Stage curtain fabrics in compliance with NFPA 701 flame propagation fire test requirements conducted by authorized testing agency, listed by UL (DIR), ITS (DIR), or FM (AG) and acceptable to authorities having jurisdiction.
   1. Permanently attach label to fabric of each curtain assembly indicating fabric treatment as follows:
      a. Inherently Flame Retardant (IFR), fibers/yarns that are non-combustible for life of fabric.

2.3 STAGE CURTAIN FABRICS

A. Provide curtains of matching fabric and color from single dye lot, and when size and quantity of curtains exceeds maximum dye lot size, provide curtain or adjacent pair of curtains from only one dye lot, and arrange curtain dye lots to minimize exposure of any differences.

B. Type A - Polyester Velour: Weighing at least 25 oz/linear yd (778 g/linear m), napped fabric of 100 percent polyester with minimum pile height of 75 mil, 0.075 inch (1.9 mm) and minimum width of 54 inches (1.37 m).
   1. Application: Front Curtain Panels, Front Masking Legs, Front Valance Panel curtains each lined with 75% fulness added.
   2. Color: As selected by Architect from manufacturer's full range.
   3. Texture: As selected by Architect from manufacturer's full range.
   4. Pattern: As selected by Architect from manufacturer's full range.
   5. Products:
      a. Fred Krieger & Company; Prestige Velour: www.fredkriegerfabrics.com/#sle.

C. Type D - Doral Opaque - Repp Fabric: Weighing at least 21 oz/linear yd (305 g/linear m), woven fabric of 35 percent modacrylic, 35 percent rayon, and 30 percent saran, with vinyl backing and 48-inch (1.22 m) minimum width.
   1. Application: Side Curtain Panel, Rear Curtain Panels, Masking Border Panel. curtains each lined with 50% fulness adeded.
   2. Color: As selected by Architect from manufacturer's full range.
   3. Texture: As selected by Architect from manufacturer's full range.
   4. Pattern: As selected by Architect from manufacturer's full range.
   5. Products:
      a. Fred Krieger & Company; IFR Doral Opaque: www.fredkriegerfabrics.com/#sle.

2.4 LININGS

2.5 CURTAIN TRACK

A. Steel Track: Commercial quality, roll-formed, galvanized steel sheet, ASTM A653/A653M, with G60 (Z180) coating designation; with continuous bottom slot and each half of track in single continuous piece; black paint finish; including support and operation accessories.
   1. Thickness: As recommended by manufacturer for curtain loads and operation.
      a. Heavy-Duty: 14-gauge, 0.0747-inch (1.90 mm) minimum thickness.
   2. Products:

B. Curtain Rails: Provide single or double curtain capacity as indicated on drawings, and end stops.

C. Clamp and Bracket Hangers: Steel clamps and brackets of required strength to support loads for attaching track to overhead support.

D. Operation:
   1. Manual Cord Operation: Curtain track with cord, pulleys, and floor pulley; must manually open and close the curtain.
      a. Operating Line: 3/8-inch (9.5 mm) diameter, stretch-resistant operating cord with braided synthetic-fiber cover over solid, synthetic-fiber, linear filaments.
      b. End Pulleys: One single dead-end and one double live-end pulley, with sheaves having shielded ball bearings housed in plated-steel covers that match track finish, and provide with bracket for securing off-stage end of curtain.
      c. Floor Pulleys: Sheave, adjustable type with 3-inch (76 mm) diameter wheels, and having shielded ball bearings housed in plated-steel covers, painted black.

E. Track System: Provide heavy-duty curtain track with components as recommended by manufacturer for loads and operation, including track end stops.

1. Carriers: Standard plated-steel carriers with a pair of nylon tired ball-bearing wheels riveted parallel to body, and equip carriers with rubber or neoprene bumpers to reduce noise and plated-steel swivel eye and trim chain for attaching curtain snap or S-hook, and required number of curtain carriers for track length and curtain fabrication.
    a. Master Curtain Carriers: One plated-steel master carrier for each leading curtain edge, with two pairs of nylon tired ball-bearing wheels and with two line guides per carrier.
2. Pulleys: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable pulley to maintain proper tension on operating line; each with gas-filled-nylon-tired ball-bearing sheaves enclosed in steel housings; pulleys with steel housing finished to match track and with bracket for securing off-stage end of curtain.

2.6 FABRICATION - CURTAINS

A. General: Provide vertical seams unless otherwise indicated, locate vertical seams so they do not fall on faces of pleats, and only use fabric that is cut greater than half the width of fabric.

B. Vertical and Top Hems: Machine sew hems as follows, unless otherwise indicated:
1. Vertical Hems: Fabricate at least 2 inches (51 mm) wide, and at least 4 inches (102 mm) wide at borders, valances, teasers, and tormentors with at least 1-inch (25.4 mm) tuck and without visible selvedge material from front of curtain; sew open ends of hems closed.
2. Turnbacks: Fabricate leading-edge and trailing-edge turnbacks for traveler curtains by folding back at least 12 inches (305 mm) of face fabric, with at least 1-inch (25.4 mm) tuck, and vertically secured by sewing.
3. Top Hems: Fabricate by double-stitching 3-1/2-inch (89 mm) wide heavy jute or laminated synthetic webbing to top edge at back side of curtain, and with at least 2 inches (51 mm) of face fabric turned under.

C. Fullness:

D. Grommets:

E. Bottom Hems: Machine sew hems as follows, unless otherwise indicated:

2.7 ACCESSORIES

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with installer present, for compliance with requirements for supporting structural members, blocking, clearances, installation tolerances, and other conditions that may impact performance of stage curtain assembly.

B. Examine placement and condition of inserts, clips, blocking, or other supports installed by others and for use in supporting track and battens of stage curtain assembly.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install stage curtain assembly in accordance with curtain and track manufacturers written instructions.

3.3 INSTALLATION - CURTAIN

A. Track Hung: Secure curtains to track carriers with S-hooks.

B. Batten Hung: Secure curtains to pipe battens with S-hooks.

3.4 INSTALLATION - BATTENS

A. Install battens by suspending at heights as indicated with trim and supports spaced as required to support loads; do not exceed 10 feet (2.54 m) between supports.
1. Cable Trim and Support:

a. Fasten cables securely to either structure or to inserts, eye screws, or other applicable devices that are appropriate for substrate and not subject to deterioration or failure with time or elevated temperatures.
b. Attach other end of cable to pipe clamps with turnbuckles, housed or fixed securely after adjustment to prevent loosening.

2. Chain Support: Secure chain as required for application with load-rated terminations.

3.5 INSTALLATION - TRACK

A. Mounting of Track Assembly:
1. Ceiling Mounted: Provide ceiling supports for mounting track direct to ceiling structure and within intervals indicated in manufacturer's written instructions for on center spacing.
2. Batten Mounted: Install track by suspending from pipe batten with manufacturer's acceptable track clamp hangers securely attached to batten pipe clamps and within intervals indicated in manufacturer's written instructions for on center spacing.

B. Track Support Spacing: Comply with manufacturer's recommendations for applied loads, and not to exceed the following dimensions between track supports:
1. Heavy-Duty Track: 6 feet (1.83 m), maximum.

C. Install track for center-parting curtains with at least 24-inch (610 mm) overlap of track sections at center-line, and supported with track lap clamps.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstrate proper operation of equipment to Brewster Central School District's designated representative.

D. Training: Train Brewster Central School District's personnel on operation and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's training personnel.
4. Location: At project site.

3.7 PROTECTION

A. Protect installed stage curtain assembly from subsequent construction operations until Date of Substantial Completion.

END OF SECTION

SECTION 12 2113
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 08 4313 - Aluminum-Framed Storefronts.

C. Section 08 5113 - Aluminum Windows.

D. Section 12 2940 - Roller Shades.

1.4 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of concealed blocking to support blinds. See Section 06 1000.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating physical and dimensional characteristics.

C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

D. Samples: Submit two samples, 12 x 12 inch (300 x 300 mm) long illustrating slat materials and finish, cord type and color.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Materials: Furnish the following for Brewster Central School District's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Lift Cords, Control Cords, and Wands: Five of each type.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum Five (5) years documented experience.

B. Installer Qualifications: Company specializing in installation of the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Horizontal Louver Blinds:

1. Hunter Douglas Architectural; CD Model: www.hunterdouglasarchitectural.com/#sle.
2. Substitutions: 01 2500 - Substitution Procedures.

2.2 BLINDS

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.

C. Metal Slats: Spring tempered pre-finished aluminum; square slat corners, with manufacturing burrs removed.
   1. Width: 1 inch (25 mm).
   2. Thickness: 0.008 inch (0.20 mm).
   3. Color: As selected by Architect from standard or premier colors.

D. Slat Support: Woven polypropylene cord, ladder configuration.

E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
   1. Color: Same as slats.

F. Bottom Rail: Pre-finished, formed aluminum; with end caps.
   1. Color: Same as headrail.

G. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.
   1. Free end weighted.
   2. Color: As selected by Architect.

H. Control Wand: Extruded solid plastic; hexagonal shape.
   1. Removable type.
   2. Length of window opening height less 3 inch (76 mm).
   3. Color: Clear.

I. Headrail Attachment: Wall brackets.

J. Locations:
   1. All Office vision panels.

2.3 FABRICATION

A. Determine sizes by field measurement.

B. Fabricate blinds to fit within openings with uniform edge clearance of 1/4 inch (3 mm).

C. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/4 inch (3 mm) between blinds, located at window mullion centers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings are ready to receive the work.

B. Ensure structural blocking and supports are correctly placed. See Section 06 1000.

3.2 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

3.3 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch (6 mm).

B. Maximum Offset From Level: 1/8 inch (3 mm).

3.4 ADJUSTING

A. Adjust blinds for smooth operation.

3.5 CLEANING

A. Clean blind surfaces just prior to occupancy.

END OF SECTION

SECTION 12 2940
ROLLER SHADES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. For locations see window schedule and drawings.

B. Manual operated bead chain clutch operated roller shades.

C. Facia.

D. Accessories.

1.3 RELATED SECTIONS

A. Section 06 1000 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.

B.

C. Section 009 2116 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.

D. Section 09 5100 - Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.

1.4 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 70 - National Electrical Code.

C. NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 3000 - Administrative Requirements.

B. Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
   1. Prepare shop drawings on AutoCAD format using base sheets provided electronically by the Architect.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

G. Maintenance Materials: Furnish the following for Brewster Central School District's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements. For additional provisions.

2. **Extra Chains: Provide 250 linear feet of #10 qualified stainless steel chain rated to 90 lb.**

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section and approved by the manufacturer. .

C. Fire-Test-Response Characteristics: Passes NFPA 701 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 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.7 MOCK-UP

A. Provide a mock-up (manual shades only) of one roller shade assembly for evaluation of mounting, appearance and accessories.
   1. Locate mock-up in window designated by Construction Manager.
   2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.10 WARRANTY

A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Standard Shade cloth: Manufacturer's standard twenty-five year.

C. Roller Shade Installation: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: MechoShade Systems, Inc., which is located at: 42-03 35th St., Long Island City, NY 11101; Tel: 718-729-2020; Web: www.mechoshade.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01 2500 - Substitution Procedures.

2.2 ROLLER SHADE TYPES

A. Manual operating, chain drive, sunscreen roller shades shall be provided at all exterior windows of classrooms and spaces shown on the Drawings. Shades are to be reverse roll unless otherwise noted.

B. Manual Shades
   1. Mounting: Surface mounted.
   2. Product: Mecho/5x bracket with facia.

2.3 SHADE CLOTH

A. Solar Shade cloths:

1. Visually Transparent Shade cloth: MechoShade Systems, Inc., ThermoVeil series, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl.
2. Color: As selected by architect from manufacturers full range.
3. Use for all shades

B. Blackout Shadecloths:
1. Fabric: ThermoVeil Vertical Privacy Weave 0900 Series (0-1% opening., blackout shadecloth with opaque acrylic backing.
2. Color: As selected by architect from manufacturers full range..

2.4 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
2. Shade Band and Shade Roller Attachment:
a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.
b. Provide for positive mechanical engagement with drive / brake mechanism.
c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.5 SHADE FABRICATI0N

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise

B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:
1. Standard concealed hem bar.

C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

D. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shadebands.

E. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shadebands.

F. Blackout shadebands, when used in side channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet (115 mm) on center extending fully into the side channels. Battens shall be concealed in a integrally-colored fabric to match the inside and outside colors of the shadeband, in accordance with manufacturer's published standards for spacing and requirements.

1. Batten pockets shall be self-colored fabric front and back RF welded into the shadecloth. A self-color opaque liner shall be provided front and back to eliminate any see through of the batten pocket that shall not exceed 1-1/2 inches (38.1 mm) high and be totally opaque. A see-through moire effect, which occurs with multiple layers of transparent fabrics, shall not be acceptable.

2.6 COMPONENTS

A. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Manual Operated Chain Drive Hardware and Brackets:

1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
8. Drive Bracket / Brake Assembly:
   a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
   b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
   c. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
   d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The

assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.

e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

f. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.7 ACCESSORIES

A. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Notching of Fascia for manual chain shall not be acceptable.

B. Bead chain Hold Down Device: WCMA approved.

C. Blocking: Provide blocking as shown on drawings including supports and anchoring.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect or Triton Construction Co.of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3200
PLASTIC LAMINATED CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Provide all plastic laminated casework and accessory items as specified herein. Refer to drawings for specific details, requirements, types and locations.
   1. All casework shall be plastic laminate, unless noted otherwise and shall include but not be limited to the following:
      a. Base cabinets
      b. Handicapped accessible workstations.
      c. Grommets.
      d. Under Counter support panels.
      e. Separate wood bases for laminated cabinets.
      f. Custom units where indicated.
      g. Locks.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section06 1000 - Rough Carpentry for blocking within walls.

B. Section 09 2116 - Gypsum Board Assemblies.

C. Section 09 6500 - Resilient Flooring. Base molding furnished and installed.

D. Section 11 3013 - Appliances and Equipment.

E. Section 12 3600 - Solid Surfacing Window Sills and Countertops for solid surface countertops.

F. Division 22 for Stainless steel sinks, fittings, traps, stops, tailpieces, vacuum breakers, electrical outlets and other fixtures, etc. Furnished and installed by plumbing contractor.Furnished and installed under Mechanical and Electrical Divisions.

1.4 DEFINITIONS

A. Identification of casework components and related products by surface visibility.
   1. Open Interiors: Any open storage unit without solid door or drawer fronts, units with full glass insert doors and/or acrylic doors, and units with sliding solid doors.
   2. Closed Interiors: Any closed storage unit behind solid doors or drawer fronts.
   3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
   4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
   5. Semi-Exposed Surfaces: Interior surfaces which are exposed to view when doors or drawers are opened, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.
   6. Concealed Surfaces: Any surface not visible after installation

1.5 QUALITY ASSURANCE

A. System Structural Performance: Casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
   1. Support Framing System: 600 lb/ft.
   2. Work Surfaces (Including Tops of Suspended Base Cabinets): 160 lb/ft
   3. Wall Cabinets (Upper Cabinets): 160 lb/ft.

4. Shelves: 40 lb/ft .
5. Delegated Design: Design casework, including comprehensive engineering analysis by a qualified professional engineer, using seismic performance requirements and design criteria indicated.
6. Seismic Performance: Casework and support framing system or including attachments to other work and shall withstand the effects of earthquake motions determined according to New York State Building Code.

B. Installer Qualifications: A single installer shall perform the work of this section, and shall be a firm with not less than five (5) continuous years of successful experience in the installation of this work, similar to that required for this project and approved by the manufacturer.
1. The installer shall provide a list of at least five (5) projects of comparable size and similar in design within a fifty mile radius of this project, which may be observed by the representative of the Architect, and or Owner.
2. Provide laminate clad casework and countertops furnished and installed by the same supplier for single responsibility and integration with other building trades.

C. Manufacturer: Minimum of ten (10) years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.
1. Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.
2. Single Source Manufacturer: Casework millwork products must all be engineered and built by a single source manufacturer in order to ensure consistency and quality for these related products. Splitting casework and architectural millwork between multiple manufacturers will not be permitted.
3. Manufacturer shall be member of the Architectural Woodwork Institute and Approved Quality Certification Program.

D. Test data performed and certified by an independent testing agency, covering the following areas of product performance:

1.	Base cabinet construction racking test.	990 lbs.
2.	Cabinet front joint loading test:	650 lbs.
3.	Wall cabinet static load test:	1,850 lbs.
4.	Drawer front joint loading test:	940 lbs.
5.	Drawer construction/static load test:	920 lbs.
6.	Cabinet adjustable shelf support device:	
	a. Static load test:	1150 lbs.
7.	Particleboard screws holding power:	Face: 225 lbs. / Edge: 155 lbs.

E. Casework must conform to design quality of materials, workmanship and function of casework specified and shown on drawings.

F. Design: Door/Drawer overlay cabinet end panels, as reveal overlay design. Door/Drawer and all cabinet body edges to be 3mm PVC as specified herein. Overlay door designs and/or edging other than specified are not acceptable.

G. 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.

H. Preinstallation Conference: Construction Manager shall schedule pre-installation meeting three (3) weeks prior to start of work at project site.

1.6 ADA AMERICANS WITH DISABILITIES ACT REQUIREMENTS:

A. The following special requirements shall be met, where specifically indicated on architectural plans as "ADA" or by General Note. To be in compliance with Federal Register Volume 56, No. 144, Rules and Regulations:

1. Countertop height: with or without cabinet below not to exceed a height of 34 inches A.F.F. (Above Finished Floor), at a surface depth of 24 inches.
    a. Knee space clearance: to be a minimum 27 inches A.F.F., and 30 inches clear span width.
    b. 12 inch deep shelving, adjustable or fixed: not to exceed a range from 9 inches A.F.F. to 54 inches A.F.F.
    c. Wardrobe cabinets: to be furnished with rod/shelf adjustable to 48 inches A.F.F., and a maximum 21 inch shelf depth.
    d. Sink cabinet clearances: in addition to above, upper knee space frontal depth to be no less than 8 inches, and lower toe frontal depth to be no less than 11 inches, at a point 9 inches A.F.F. and as further described in Volume 56, Section 4.19.
    e. No cabinets shall be install closer than 18” to the pull side of any door. Co-ordinate with electrical drawings for electrical devices.

1.7 SUBMITTALS

A. Comply with Section 01 3000 - Administrative Requirements, unless otherwise indicated

B. Shop Drawings:
1. Submit CAD production shop drawings prepared by manufacturer for laminate clad casework and countertops showing layout, elevations, ends, cross-sections, service run spaces, specific modifications, component connections, anchorage details, location methods, hardware, and installation procedures .
2. Verify all dimensions and conditions in field.
3. Include layout of units with relation to and clearances of surrounding walls, doors, windows, and other building components.
4. Indicate locations of blocking and reinforcements required for installing casework.
5. Coordinate shop drawings with other work involved.

C. Samples: When requested by Architect:
1. Submit 2-2" x 3" samples of casework manufacturer's standard decorative laminate colors, patterns and textures, for exposed and semi-exposed materials for architect's selection. Samples will be reviewed by Architect for color, texture, and pattern only. Compliance with other specified requirements is the exclusive responsibility of the contractor.
2. Submit one full-size sample base cabinet unit with hardware, doors and drawers, without countertop.
3. Submit one full-size sample wall cabinet unit complete with hardware, doors, and adjustable shelves.
4. Acceptable sample units will be used for comparison inspections at the project. []
    a. Notify Construction Manager of their exact locations of incorporated units. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work.
    b. Remove sample units from the premises when directed by the Construction Manager
5. Plastic-laminate products, 8 by 10 inches, for each type, color, pattern, and surface finish.
6. Corner pieces as follows:
    a. Miter joints for standing trim.
7. Component samples: Two sets of samples for each of the following:
    a. Decorative laminate color charts, PVC edgings, and Solid surface countertops.

1.8 PRODUCT HANDLING:

A. Deliver laminate clad casework and countertops only after wet operations in building are completed.

B. Store completed laminate clad casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 25% to 55%.

C. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

1.9 JOB CONDITIONS:

A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.
   1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
   2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.

B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete

1.10 WARRANTY:

A. All materials shall be guaranteed for a period of 5 years from manufacturer's defects and workmanship from date of acceptance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. For purpose of determining minimum performance and quality standards, this specification is based upon drawings, specifications and manufacturer’s literature from TMI SYSTEMS CORPORATION, 50 South Third Avenue West, Dickinson, North Dakota, 58601, Phone: 800-456-6716, fixed modular and accessories..
   1. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

B. Regardless of manufacturer or model numbers, if indicated, construction shall be in accordance with TMI Systems Corporation and AWI Architectural Woodwork Standards (AWS)s for modular cabinets except where modified by these specifications. Where standard manufacturers' units do not conform to layout and/or dimensions indicated, custom fabricate unit to conform to these specifications unless such non-conformance is specifically approved by the Architect.
   1. Submit proof of ability to provide Certificate of Compliance in AWI, Architectural Woodwork Institute Quality Certification Program .

2.2 MATERIALS:

A. Core Materials:
   1. All core material shall be a blended bio fiber composition with ultra-low formaldehyde resin system. Board shall exceed performance requirements listed below. Testing for conformance to the listed specifications must be done in accordance with procedures described in the American National Standard for Particleboard (ANSI A208.1 2016 section 5.2 Sampling for Acceptance). Board shall comply with formaldehyde emission requirements for Particleboard in CPA-ECC-2011, ANSI A208.1 2016 and CCR 93120.2 (CARB Composite Wood ATCM Phase II) Casework manufacturer shall provide documentation and certification of use within the entire cabinet. No formaldehyde, no exceptions.
   2. Core material shall meet the following average performance requirements: Submit compliance data from the manufacturer prior to fabrication:
      a. Density: Minimum 45 lbs.
      b. Modulus of Rupture: 1,800 psi.
      c. Modulus of Elasticity: 298,000 psi.
      d. Average Internal Bond: 80 psi.
      e. Screw holding Face: 2 225 lbs.
      f. Screw holding Edge: 155 lbs.
      g. Thickness Tolerance: 0.003+/- inches.

h. Linear expansion: 0.2%
i. Thickness swell: 5.5%
j. Thickness used are 1/4", 1/2", 3/4" and 1".
k. Plywood: Shall be 9-ply pressure treated hardwood plywood, “A” faced, hardwood veneer.
l. Provide moister resistant core material at sink locations and wet areas:
   a) Meeting ANSI MR10 minimum requirements, adding protection against occasional wetting and high humidity.

B. Decorative Laminates:
1. High Pressure Decorative Laminates (HPDL) shall be as follows:
   a. Horizontal Surfaces:
      a) 107HGS, matte finish, nominal thickness .048.±005 HIGH WEAR as manufactured by Wilsonart Brand Decorative Laminate
      b) 10/HGS – High Pressure Grade .048 ±005 as manufactured by Formica Brand Laminate.
   b. Exposed Casework Surfaces, Including Exposed Interior Surfaces:
      a) 335VGP, matte finish, nominal thickness .028. +0.001-0.004 HIGH WEAR as manufactured by Wilsonart Brand Decorative Laminate.
   c. Thermally Fused Laminate (TFL) meeting, NEMA Test LD 3-2005. (TFM allowed on casework interiors only, as specified below. Utilization of TFL on any exterior casework surfaces, including door and drawer faces and finished ends, will not be permitted.)
   d. All laminate shall be counter balanced with heavy gauge neutral colored backing sheet.
2. Plastic laminate shall comply with the following minimum:

PHYSICAL PROPERTIES

PYSICAL PROPERTIES	LD3 TEST	Type 107	Type 335
Appearance	3.1	No ABC Defects.	No ABC Defects
Light Resistance	3.3	Slight.	Slight
Cleanability	3.4	10.	10.
Stain Resistance	3.4		
Reagents 1 - 10		No Effect.	No Effect.
Reagents 11 - 15		Slight.	Slight.
Boiling Water Resistance	3.5	No Effect.	No Effect.
High Temperature Resistance	3.6	Slight.	No Effect.
Ball Impact Resistance - in	3.8	65	40".
Radiant Heat Resistance - sec	3.10	210 minimum.	200.
Dimensional Change	3.11		
Machine Direction -%		0.3	0.5
Cross Direction - %		0.7	0.8
Wear Resistance - cycles	3.13	400 (min.)	400 (min.)
Formability - inches		N/A	5/16".
Blistering -sec		N/A	45.
Weight:		0.322 psf.	0.186 psf
Fire Rating: ASTM E -84:			
As required by NYS Building Code		Flame spread 50	45.
		Smoke: 45	40.

3. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

C. Laminate Color Selection as indicated on drawings are as selected by the Architect. Final acceptance of colors by other manufacturer(s) even if listed, as "acceptable manufactures" shall be at the sole discretion of the Architect.

D. Edgebanding: 3mm PVC banding, machine applied with waterproof hot melt adhesive with external edges and outside corners of door machine profiled to 1/8" radius for safety.

E. Metal Parts: Countertop support brackets, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder coated in color selected by the Architect.

2.3 CABINET HARDWARE:

A. Hinges:
1. Shall be five knuckle, epoxy powder coated, institutional grade, 2 3/4" overlay type with hospital tip, eased edges for safety, and a full, 270º door swing for easy access Steel shall be minimum .095" thick and have minimum of nine (9) edge and leaf fastenings. Hinges shall pass ANSI-BHMA standard A156.9, Grade 1 requirement for both vertical and horizontal set and sag (pair of hinges will hold minimum of 310 pounds); copy of test result shall be provided upon request. Casework manufacturer shall use nine specifically engineered screws for attachment of hinges; wood screws shall not be permitted. Doors 48" and over in height shall have three (3) hinges per door.
2. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.
3. Color: As selected by the Architect.
4. Provide magnetic door catch with minimum seven (7) pound pull, attached with screws and slotted for adjustment. (Not ADA)

B. Pulls:
1. Door and drawer front pull shall be ABS plastic, semi recessed, designed of molded plastic and a large gripping space, impact resistance, and no sharp edges. Pull design shall be compatible with Americans with Disability Act (ADA), Federal Register Volume 56, No. 144, specifically paragraph 4.27.4. Other pulls may be acceptable pending architect approval.
   a. Color: As selected by the Architect

C. Drawer Slides:
1. Standard use and knee space drawers shall be Accuride 3600 series or equal with epoxy coated steel finish. Slides will have a 150 pound load rating a**t full extension a**nd shall be bottom corner mounted with smooth and quiet nylon rollers, a built-in positive stop both directions, with self closing feature. Slides shall have a lifetime warranty as offered by the slide manufacturer.

D. Adjustable Shelf Supports:
1. Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support has 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support automatically adapts to 3/4 inch or 1 inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure

E. File Suspension System: Extruded molding integral with top of drawer box sides to accept standard hanging file folders.

F. Under counter Support Frame:
1. Welded steel countertop support frames shall be provided at all knee spaces where indicated on drawings. Frames shall be available in 3" increments to clear span 24" to 60" width. Frames shall readily accept pencil and knee space drawers, and shall be designed to interface under counter support brackets. Color as selected by Architect.
   a. Model: #635.68.271

b. Manufacturer: Hafle of America 1-800-423-3531

G. Grommets: Mockett, mocket.com; "BRV2" flush mounted, single slot with steel cap.
1. Finish Satin aluminum.

H. Cable/Data Trays: Provide plastic laminate tray where shown on drawings.

2.4 LOCKS:

A. Provide for all doors and drawers. Locks shall be cam style with strike. Each lock shall be furnished with two (2) keys.

B. Locks shall be keyed alike for each room and MASTERKEYED. Keying shall be reviewed with Owner and approved in writing by the Owner.

C. Lock for sliding glass/acrylic doors is a ratchet type sliding showcase lock.

D. Chain bolts shall be 3" long, shall have a 18" pull and an angle strike to secure inactive door on cabinets over 72" in height. Elbow catches shall be used on inactive doors-up to and including 72" in height.

2.5 SPECIALTY ITEMS

A. Support Members:
1. Countertop support brackets: 1" Plastic laminate as shown on drawings.

B. Paper Storage Cabinet:
1. Paper storage cabinet with locking double doors with seven equal drawers behind.

2.6 SOLID SURFACING COUNTERTOP

A. Refer to Section 12 3600 - Solid Surfacing Window Sills and Countertops.

2.7 FABRICATION

A. Detailed Requirements for Cabinet Construction:
1. Sub-Base: Cabinet Subbase: To be separate and continuous (no cabinet body sides-to-floor), 3/4" water-resistant exterior grade plywood, 4" high, with concealed fastening to cabinet bottom. Ladder-type construction, of front, back and intermediates, to form a secure and level platform to which cabinets attach. Casework with integral sides or sides running to the floor will be rejected.
2. Sub-base at exposed cabinet end panels shall be recessed 1/4 inch (6.4 mm) from face of finished end, for flush installation of finished base material by other trades.

B. Fabricate casework to dimensions, profiles, and details shown.
1. Cabinet Body Construction:
a. Fabricate casework, countertops and related products to dimensions, profiles, and details shown on shop drawings.
b. All casework panel components must go through a supplemental sizing process after cutting, producing a panel precisely finished in size and square to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.
c. Solid sub-top shall be furnished for all base and tall cabinets.
d. At cabinets over 36 inches wide, bottoms and tops shall be joined by a fixed vertical divider.
e. Exterior exposed wall cabinet bottoms shall be white thermally fused laminate (TFL) on both sides. Assembly devices shall be concealed on bottom side of wall cabinets
f. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets. (Mechanical or metal hardware fasteners joining cabinet top and bottom panels to the sides will not be accepted.)
a) Tops, bottoms and sides of all cabinets are particleboard core

g. Unless specifically indicated, core shall be 3/4" thick particleboard. Edging and surface finishes as indicated herein.

h. Cabinet backs: 1/4 inch thick medium density fiberboard panel fully captured by the cabinet top, bottom and side panels. Finish to match cabinet interior. 3/4 inch x 4 inch particleboard rails will be placed behind the back panel at the top and bottom, and doweled to the sides utilizing 10mm hardwood fluted dowels. A third intermediate rail will be included on all cabinets taller than 56 inches. Utilize hot melt glue to further secure back and increase overall strength
   a) Exposed back on fixed or movable cabinets to be 3/4" particleboard, color matched to cabinet interior, exterior surface GP28 laminate as selected.
   b) Hang rails shall be located at rear of cabinet back and fastened to cabinet sides. Provide minimum of 2 at base, 2 at wall, and 3 at tall cabinets.

i. Base units, except sink base units: Full sub-top glued and doweled to cabinet sides. (Mechanical or metal hardware fasteners joining cabinet sub-top panel to the sides will not be accepted.)
   a) Sink base units are provided with open top and a stretcher at the front, attached to the sides. Back to be split removable access panel.

j. All end panels and vertical dividers, except sink base units, shall be prepared to receive adjustable shelf hardware at 32mm (approximately 1-1/4") centers. Door hinges, drawer slides and pull-out shelves shall mount on line boring to maintain vertical alignment of components and provide for future relocation of doors, drawers, shelves and/or pull-out shelves.

k. All exposed and semi exposed edges of basic cabinet components shall be factory edged with 3 mm PVC banding, machine applied with waterproof hot melt adhesive. Color as selected by the Architect.

l. Adjustable Shelves in Cabinets
   a) Core: Particleboard.
   b) Core Thickness: 3/4 inch up to 30 inches wide, 1 inch over 30 inches wide.
   c) Edge: 3mm PVC on Front Edge Only

m. Interior finish, units with open Interiors:
   a) Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with Thermally Fused Laminate (TFL).

n. Interior finish, units with closed Interiors:
   a) Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with Thermally Fused Laminate (TFL).

o. Exposed ends:
   a) Faced with high-pressure decorative VGS laminate. Use of TFM on exposed ends will not be permitted.

p. Wall and Tall Unit Tops: (when visible from above):
   a) The top edge of all wall and tall unit end panels shall be factory edged with 3mm PVC to match basic cabinet body color; raw edges at top of wall and tall end panels will not be permitted.
   b) Top surface will be laminated with melamine in color as selected by the Architect.

q. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), will not be permitted. No exceptions.

PART 3 - EXECUTION

3.1 INSPECTION:

A. The installer must examine the jobsite and the conditions under which the work under 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.

3.2 PREPARATION:

A. Condition laminate clad casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 COORDINATION:

A. Verify site dimensions of cabinet locations in building prior to fabrication.

B. Coordinate layout and installation of framing and reinforcements for support of casework, and equipment furnished by others and installed in casework..

C. Coordinate installation of roughing with other prime contractors.

D. Coordinate layout and installation of framing and reinforcements for support of casework.

E. Coordinate installation of casework with installation of other casework equipments and accessories

3.4 INSTALLATION OF CABINETS

A. Install all base cabinets on a separate wood base.

B. Install insulation to rear of cabinets as detailed.

C. Install level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
6. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
    a. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than 2 fasteners per side.
7. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c.
8. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
9. Adjust casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

D. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.

E. All fasteners shall be approved by the architect and provide with screw caps or approved washers. Gypsum board screws are not permitted.

3.5 INSTALLATION OF COUNTERTOPS

A. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.

1. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.
    a. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not

exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

2. Fastening:
   a. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
   b. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.
      a) Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
3. Provide required holes and cutouts for service fittings.
   a. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.
   b. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
   c. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.6 PROTECTION

A. Storage and Protection: Casework shall be protected in storage. Store under cover in a ventilated building not exposed to extreme temperature and humidity changes. Store off the floor to prevent chipping of laminate. Do not store or install casework in building until concrete, masonry or other wet trades are dry.

3.7 ADJUSTING

A. Repair or remove and replace defective work, as directed by (Architect/Owner) upon completion of installation.

B. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly.

3.8 CLEANING AND PROTECTION:

A. Repair or remove and replace defective work as directed upon completion of installation.
   1. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
   2. Remove all cartons, debris, sawdust, scraps, etc. and leave space ready for final cleaning.
   3. Protect all casework and tops from damage by other trades until acceptance of the work by the Owner.

END OF SECTION

SECTION 12 3600
SOLID SURFACING WINDOW SILLS AND COUNTERTOPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Window sills.

B. Countertops for manufactured casework.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry for wood blocking.

B. Section 08520 - Aluminum Windows

C. Section 123200 - Plastic Laminated Casework.

1.4 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. PS 1 - Structural Plywood; 2009.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

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. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation .

D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section, with minimum ten years of documented experience.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 WINDOW SILL AND COUNTERTOP ASSEMBLIES

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Window Sills and Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate:

1. Flat Sheet Thickness: 1/2 inch (12.5 mm), minimum.
2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   a. Manufacturers:
      a) Dupont: www.corian.com.
   b. Substitutions: 01 2500 - Substitution Procedures.
3. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 25, maximum; when tested in accordance with ASTM E84.
4. Finish on Exposed Surfaces: Polished, gloss rating of 55 to 80.
5. Color and Pattern: As indicated on finish schedule.

2.2 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, color as selected..

1. Mildew resistant conforming to FDA NSF 51, UL listed.

2.3 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and sides 1 inch (25 mm) or as shown on drawings.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches (102 mm), unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 72 inches (1800 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions. Form joints between components to be non conspicuous.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

A. Verify dimensions of all existing countertops to be replaced.

B. Clean surfaces thoroughly prior to installation.

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. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach solid surfacing window sills using compatible adhesive and mechanical fastened.
   1. Countersink screws and plug opening with matching material.

C. Attach solid surfacing window sills using compatible silicone bonding material.

D. Seal joint between window sills back and end splashes and adjacent surfaces.

E. Provide products in largest pieces available.

F. Cut and finish edges with clean sharpe returns.

G. Provide radius at outside corners.

H. Dress joints smooth, remove surface scratches and clean entire surfaces.

I. Installation of Countertops
   1. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
      a. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.
         a) Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.
      b. Fastening:
         a) Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
         b) Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.
            (a) Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
      c. Provide required holes and cutouts for service fittings.
         a) Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.

b) Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

c) Carefully dress joints smooth, remove surface scratches, and clean entire surface.

2. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

J.

3.4 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

3.5 CLEANING

A. Clean surfaces thoroughly. Remove adhesives, sealant and other stains.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 4813
ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Carpet mat.

B. Recessed mat, stainless steel frame.

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).
   1. Flammability in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m2.
   2. Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes

B. The Aluminum Association

C. The Carpet and Rug Institute (CRI)

D. The National Floor Safety Institute (NFSI)

E. International Organization for Standardization (ISO)

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of experience .

C. Standard rolling load performance is 400 lb./wheel with larger loading requirements as specified (load applied to a solid 5” x 2” wide polyurethane wheel, 1000 passes without damage).

D. Manufacturer's certification that product meets or exceeds the specification.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.

C. Shop Drawings: Indicate dimensions and details for recessed frame.
   1. For recessed frames located within a dimensionally restricted area, show dimensions of space within which the frame will be installed.

D. Samples: Submit two samples, 13 by 13 inch (- by -- mm) in size illustrating pattern, color, finish , and edging.

E. Maintenance Data: Include cleaning instructions, stain removal procedures and cleaning and maintaining floor mat

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

B. Recessed Conditions: Coordination with Division 03 0000 Concrete specifications is required. For proper installation, the concrete recess must be flat and smooth throughout.

1. If the recess is formed by a concrete contractor, the pour dimensions may require leveling grout to achieve the proper depth and a smooth finish.
2. Verify depth matches the specified product.
3. Verify side walls of the concrete recess are straight and smooth.
4. Inconsistencies shall be remediated prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Entrance Floor Mat Frame
   1. Schluter : DECO, Stainless Steel 304
   2. Substitutions: Section 01 2500 Substutution Procedures.

2.2 ENTRANCE FLOOR MAT AND FRAME

A. Entrance Floor Mat Recessed Frame: Recessed stainless steel perimeter frame.
   1. Product: Schluter - DECO, E 100D
   2. Recess Depth: 5/16"

B. Entrance Floor Mat 24" x 24" Carpet tile.
   1. Product: Mohawk Group, First Step II, Tuff Stuff Collection.
      a. Construction: Tufted
      b. Backing Material: EcoFlex NXT
      c. Pile wieght: 38 oz/yd
      d. Denstity: 6739
      e. Color Code: 955, Cobalt
      f. Style no.: GT315

C. Mounting: Top of non-resilient members level with adjacent floor.

D. Structural Capacity: Capable of supporting a rolling load of 500 pounds (226.8 kg) without permanent deformation or noticeable deflection.

E. Vibration Resistant Fabrication: All members welded, riveted, or bolted; no snap or friction connections.

2.3 FABRICATION

A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor opening for mats are ready to receive work.

3.2 PREPARATION

A. Mats: Verify size of floor recess before fabricating mats.

B. Vacuum clean floor recess.

3.3 INSTALLATION

A. Install frames to achieve flush plane with finished floor surface.

B. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

3.4 TOLERANCES

A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch (6 mm).

END OF SECTION

SECTION 14 2100
ELECTRIC TRACTION ELEVATOR

GENERAL

1.1 Summary

A. This section specifies electric traction elevators.

B. Work Required

1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.
2. All work shall be performed in a first class, safe and workmanlike manner.
3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

1.2 Related Sections

A. The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.

1. Section 01 50 00 – Temporary Facilities and Controls: protection of floor openings and personnel barriers; temporary power and lighting.
2. Section 03 30 00 – Cast-In-Place Concrete: elevator pit and elevator machine foundation.
3. Section 04 20 00 – Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.
4. Section 05 50 00 – Metal Fabrications: pit ladder, divider beams, supports for entrances and rails, and hoisting beam at top of elevator hoistway.
5. Section 07 1300 – Sheet Waterproofinge, elevator pit.
6. Section 26 05 00 – Common Work Results for Electrical:
    a. Main disconnects for each elevator.
    b. Electrical power for elevator installation and testing.
    c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
    d. The installation of dedicated GFCI receptacles in the pit and overhead.
    e. Lighting in controller area, machine area and pit.
    f. Wiring for telephone service to controller (if applicable).

1.3 References

A. Comply with applicable building and elevator codes at the project site, including but not limited to the following:

1. ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.
2. ASME A17.7/CSA B44, Performance-Based Safety Code for Elevators and Escalators.
3. ADAAG, American Disabilities Act Accessibility Guidelines.
4. ANSI A117.1, Building and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
5. ANSI/NFPA 70, (NEC) National Electrical Code.
6. CAN/CSA C22.1, (CEC) Canadian Electrical Code.
7. ANSI/UL 10B, Standard for Fire Test of Door Assemblies.
8. CAN/ULC-S104-10, Standard Method for Fire Test of Door Assemblies.
9. ANSI/NFPA 80, Standard for Fire Doors and Other Opening Protectives.
10. Building Codes IBC or NBCC.
11. All Local Jurisdictional applicable codes.

1.4 System Description

A. Equipment Description: Gen3 Core™ gearless machineroom less elevator where all components fit inside the hoistway.

B. Equipment Control: Elevonic® Control System.

C. IoT Connectivity: Elevator connected to Otis ONE IoT Platform

D. Drive: Regenerative

E. Quantity of Elevators: 1

F. Elevator Stop Designations: 1, 2

G. Stops: 2

H. Openings: Front and Rear

I. Travel: 12’-8” (3861 mm)

J. Pit Depth: 5’-0” (1524 mm)

K. Rated Capacity: 2100 lb (953 kg)

L. Rated Speed: 150 fpm (.76 m/s)

M. Laminate Cab Clear Inside Dimensions: 5’-8 5/16" Width x 4’-3 9/16” Depth (1735 mm Width x 1309 mm Depth)

N. Cab Height: 7’-9” (2362 mm)

O. Clear Cab Height: 7’-8 ?” (2340 mm) with 1 ¼” (32 mm) Floor Recess and 4 LED Ceiling

P. Entrance Type and Width: Single-Speed Side Opening Door – 36” (914 mm)

Q. Entrance Height: 7’-0” (2134 mm)

R. Main Power Supply: 208 volts ± 5% of normal, three-phase, with a separate equipment grounding conductor.

S. Car Lighting Power Supply: 120 volts, single-phase, 15 amps, 60 Hz.

T. Machine Location: Rail-mounted at the top of the hoistway.

U. Signal Fixtures: Manufacturer’s standard with metal button targets (excluding CA).

V. Controller Location: Machine Roomless controller(s) must be jamb-mounted on the same side as the counterweight, located at the top landing.

W. Performance:

1. Car Speed: ± 3 % of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold up to 120% of rated load (code required).
3. Ride Quality:
   a. Vertical Vibration (maximum): 20 milli-g
   b. Horizontal Vibration (maximum): 12 milli-g
   c. Vertical Jerk (maximum): 4.59 ± 1.0 ft./ sec3 (1.4 ± 0.3 m/ sec3)
   d. Acceleration/Deceleration (maximum): 2.62 ft./ sec2 (0.8 m/ sec2)
   e. In Car Noise: 55 – 60 dB(A)
   f. Stopping Accuracy: ± 0.375 in. (± 10 mm) max, ± 0.25 in. (± 6 mm) Typical
   g. Re-leveling Distance: ± 0.5 in. (± 12 mm)

X. Operation: Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

Y. Operation Features – Standard

1. Full Collective Operation

2. Anti-nuisance.
3. Fan and Light Protection.
4. Load Weighing Bypass.
5. Independent Service.
6. Firefighters' Service Phase I and Phase II (USA only); or Special Emergency Service Phase I and II – Emergency Recall and In-Car Emergency Operation (Canada only).
7. Top of Car Inspection.
8. Zoned Access at Bottom Landing.
9. Zoned Access at Top Landing

Z. Operation Features – Optional
1. Express Priority Service with key-switch(es)
2. Emergency Hospital Service.
3. Automatic Rescue Operation
4. Automatic Standby Power Operation with Manual Override.

AA. Door Control Features:
1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.
3. Door protection shall consist of a two-dimensional or a code required, three-dimensional, multi-beam array projecting across the car door opening.
4. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

1.5 Submittals

A. Product Data: Submit manufacturer’s product data for each system proposed for use. Include the following:
1. Signal and operating fixtures, operating panels and indicators.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in hoistway (BTU).
6. Color selection chart for Cab and Entrances.

B. Shop Drawings: Submit approval layout drawings. Include the following:
1. Car, guide rails, buffers, and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Clearances and travel of car.
5. Clear inside hoistway and pit dimensions.
6. Location and sizes of access doors, hoistway entrances and frames.

C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

1.6 Quality Assurance

A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.

B. Manufacturer shall have a minimum of fifteen years of experience in the fabrication, installation and service of elevators.

C. Installer: Elevators shall be installed by the manufacturer.

D. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.7 Delivery, Storage, and Handling

A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.

B. Should the storage area be off-site, and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

1.8 Warranty

A. The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The warranty period shall not extend longer than one (1) year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The warranty excludes: ordinary wear and tear, improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

1.9 Maintenance and Service

A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of 12 Months after the elevator has been turned over for the customer's use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs, or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

B. The periodic lubrication of elevator components shall not be required, including Sheaves, Rails, Belts, Ropes, Car and Counterweight guides, etc.

C. The elevator control system must:

1. Provide in the controller the necessary devices to run the elevator on inspection operation.
2. Provide on top of the car the necessary devices to run the elevator in inspection operation.
3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
4. Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

PART 2 - PRODUCTS

2.1 Select Manufacturers List

A. Manufacturer: Design based upon Otis Elevator's Gen3 Core™ machine room-less elevator system.

B. Acceptable Substitutions

1. KONE; MonoSpace 300 DX: www.kone.us/#sle.

2. DOVER, ReGen, machine room-less.

C. Substitutions: See Section 01 2500 Substitution Procedures.

D. Products other than Basis of Design are subject to compliance with specified requirements. By using products other than Basis of Design, the Contractor accepts complete responsibility for costs associated with any necessary modifications to Elevator and all related work, including administrative,design, contract or construction requirements and associated fees required by the substituted manufacturer.

E. Source Limitations: Provide elevator and associated equipment and components produced by a single manufacturer and obtained from a single supplier.

2.2 Description

A. Gen3™ Core traction passenger elevators from Otis Elevator Company. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:

1. Controller located entirely inside the hoistway.
2. An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.
3. Polyurethane Coated-Steel Belts for elevator hoisting purposes.
4. Regenerative drive that captures normally wasted energy and feeds clean power back into the building's power grid.
5. LED lighting standard in ceiling lights and elevator fixtures.
6. Sleep mode operation for LED ceiling lights and car fan.

B. Approved Installer: Otis Elevator Company (or approved equal substitution.)

2.3 Controller

A. Controller: A microcomputer-based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.

1. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
2. Controller shall be separated into two distinct halves: Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
4. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"
5. Controller shall be located inside the wall next to the top landing entrance frame. Emergency access shall be provided through an access panel in the entrance frame secured by a key lock.

B. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

2.4 Hoistway Components

A. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.

B. Governor: The governor shall be a tension type car-mounted governor.

C. Buffers, Car, and Counterweight: Polyurethane type buffers shall be used for speeds of 150 and 200 feet per minute.

D. Hoistway Operating Devices:

1. Emergency stop switch in the pit.
2. Terminal stopping switches.

E. Positioning System: Consists of an encoder, reader box, and door zone vanes.

F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.

G. Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. The belts shall have an FT-1 rating as referenced by NFPA 13. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance-based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.

H. Governor Rope: Shall be steel and shall consist of at least eight strands wound about a sisal core center.

I. Fascia: Galvanized sheet steel shall be provided in accordance with code requirements.

J. Hoistway Entrances:

1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel. The entrance profile (jamb face) shall be a width of 2 7/8” (73 mm).
2. Sills shall be extruded aluminum.
3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
4. Fire Rating: Entrance and doors shall be UL fire rated for 1-½ hour
5. Entrance Finish: Brushed Stainless Steel
6. Entrance Marking Plates: Entrance jambs shall be marked with 4” x 4” (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
7. Sight Guards: Sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel doors.

2.5 Car Components

A. Car Frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall be Type "B", flexible guide clamp type.

B. Cab: Laminate Cab with vertical high-pressure laminate wall panels; laminated woodgrains, patterns and solid selections available from the manufacturer’s standard selection chart.

C. Car Front Finish: Brushed Stainless Steel

D. Car Door Finish: Brushed Stainless Steel

E. Flush Ceiling with 4 LED Lights

F. Ceiling Finish: Brushed Stainless Steel

G. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

H. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

I. Handrails: Provided on the side and rear walls of the car enclosure. They shall be, 1 ½” diameter (38.1 mm) Round Bar Handrail s with a Brushed Steel Finish.

J. Threshold: Extruded Aluminum

K. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

L. Guides: The car shall have 3" diameter roller guides at top and bottom and the counterweight shall have slide type guides at the top and the bottom. Optional counterweight guides available.

M. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.

N. The LED ceiling lights, and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

O. Certificate frame: Provide a Certificate frame with a satin stainless steel finish.

P. Elevator Cab Pads

2.6 Signal Devices and Fixtures

A. Car Operating Panel: A Standard Otis ONE™ Pro flat applied car operating panel with a surrounding injected molded bezel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a brushed stainless steel finish and include a service cabinet. (A second COP is available)

1. The car operating panel shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:
   a. Flush Mounted brushed stainless steel buttons with white LED illuminating halos.
   b. Lexan (3mm) projecting fully illuminated buttons with white LEDs
2. The car operating panel shall be equipped with the following features:
   a. Raised markings and Braille to the left-hand side of each push-button.
   b. Car Position Indicator at the top of and integral to the car operating panel.
   c. Door open and door close buttons.
   d. Inspection key-switch.
   e. Elevator Data Plate marked with elevator capacity and car number.
   f. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
   g. Display Screen: Include display screen located near the top of the COP. The display screen shall display the car position indicator, travel direction arrows, elevator status jewels, and provide emergency text communication.
   h. Camera: Include camera located above display screen for emergency video communication. This camera is for emergency communication only.
   i. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
3. Note: Below are Standard for USA and optional in Canada.
   a. In car stop switch (toggle or key unless local code prohibits use)
   b. Firefighter's hat (standard USA)
   c. Firefighter's Phase II Key-switch (standard USA)
   d. Call Cancel Button (standard USA)
4. Note: Below are optional.
   a. Firefighter's Phase II Emergency In-Car Operating Instructions: worded according to A17.1 2000, Article 2.27.7.2.
   b. Please Exit Symbol: provided with emergency hospital service, or express priority in the hall.

B. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.

C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall include:

D.

1. Round stainless steel, mechanical buttons located in the entrance frame face mounted vertically. Fixtures shall be brushed stainless steel finish.
   a. Flush Mounted brushed stainless steel buttons with white LED illuminating halos.
   b. Lexan (3mm) projecting fully illuminated buttons with white LEDs.
2. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound.

E. Access key-switch at top floor in entrance jamb is optional.

F. Access key-switch at lowest floor in entrance jamb is optional.

2.7 EMERGENCY POWER

A. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.
   1. Provide internal battery power to allow elevator to return to level of exit discharge and for hoistway and cab doors to open.

B. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.

2.8

PART 3 - EXECUTION

3.1 Preparation

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 Installation

A. Installation of all elevator components except as specifically provided for elsewhere by others.

B. Installation of all elevator components except as specifically provided for elsewhere by others.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Contractor shall provide testing and inspections certified in accordance with ASME QEI-1 .
   1. Schedule tests with agencies and notify Brewster Central School District and Architect.
   2. Document regulatory agency tests and inspections in accordance with requirements.
   3. Perform tests required by regulatory agencies.
   4. Furnish test and approval certificates issued by authorities having jurisdiction (AHJ).

C. Perform testing and inspection in accordance with requirements.
   1. Inspectors shall be certified in accordance with ASME QEI-1.
   2. Perform tests in accordance with ASME A17.2.
   3. Provide at least two weeks written notice of date and time of tests and inspections.
   4. Supply instruments and execute specific tests.

D. Operational Tests:
   1. Perform operational tests in the presence of Brewster Central School District and Architect.
   2. Provide load test in accordance with NYS Building code.
   3. Test single elevator system by transporting at least four (4) persons up from main floor to top floor landings during a five minute period.

4. At an agreed time, and the building occupied with normal building traffic, conduct tests to verify performance.
    a. Furnish event recording of each landing call registrations, time initiated, and response time throughout entire working day.

3.4 ADJUSTING

A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.

B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch (6.4 mm) maximum from flush with sill.

3.5 CLEANING

A. See Section 01 7000 - Execution for additional requirements.

B. Remove protective coverings from finished surfaces.

C. Clean surfaces and components in accordance with manufacturers written instructions.

D. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.6 Demonstration

A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner’s representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

B. Training: Train Brewster Central School District's personnel on cleaning and operation and maintenance of system.
    1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
    2. Provide minimum of two hours of training.
    3. Instructor: Manufacturer's training personnel.
    4. Location: At project site, unless otherwise indicated.

END OF SECTION

SECTION 14 4200
WHEELCHAIR LIFTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vertical platform wheelchair lifts.

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Blocking in framed construction for lift attachment.

B. Section 09260 - Gypsum Board Assemblies

C. Division 16 - Electrical: Electrical power service and wiring connections.

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.

C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts; 2020.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

F. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

H. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015 (Reapproved 2021).

I. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

K. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. ITS (DIR) - Directory of Listed Products; current edition.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of wheelchair lift system with adjacent construction using necessary attachments; provide anchoring devices in accordance with manufacturer's installation instructions; coordinate installation of cast-in-place concrete components.

1. Electrical System: Coordinate utility and electrical system connections to ensure they are made in an orderly and expeditious manner.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Include data on material descriptions, construction details, component dimensions and profiles, and finishes; include data on rated capacities, electrical and operating characteristics, and necessary accessories.

C. Shop Drawings: Include plans, elevations, sections, and attachment details; include equipment assembly details with dimensions, weights, loads, required clearances, components, size and location of anchors and

required field connections, and methods for field assembly; provide diagrams indicating signal, power, and control wiring.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Testing agency's qualification statement.

G. Maintenance contracts.

H. Executed warranty.

I. Project Record Documents: Accurately record actual locations of concealed items, conduits, and components.

J. Maintenance Materials: Provide the following for Brewster Central School District's use in maintenance of wheelchair lifts and equipment.

1. See Section 01 6000 - Product Requirements for additional provisions.
2. Provide technical information for servicing operating equipment.
3. Spare Parts: Provide parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
4. Provide legible schematic wiring diagrams of installed electrical equipment and changes made to this part of work; list symbols corresponding to identity or markings on wheelchair lifts structural and electrical components.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Provide wheelchair lift design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in New York.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

E. Documents at Project Site: Maintain at project site one copy of manufacturer's installation instructions, erection drawings, shop drawings, and reference standard documents.

1.7 FIELD CONDITIONS

A. Use of wheelchair lifts during construction for hoisting materials or personnel is not permitted.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty to repair or replace wheelchair lift system components that fail in materials or workmanship. Complete forms in Brewster Central School District's name and register with manufacturer.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A18.1, ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).

B. Accessibility Requirements: Comply with ADA Standards and ICC A117.1.

C. Structural Performance: Comply with ASCE 7 for loading of wheelchair lift components and assemblies.

D. Perform welding of steel in accordance with AWS D1.1/D1.1M.

E. Perform electrical work in accordance with NFPA 70.

F. ASME A17.1 - Safety Code for Elevators and Escalators.

G. ASME A17.5 - Elevator and Escalator Electrical Equipment.

H. CSA B355 - Lifts for Persons with Physical Disabilities.

I. CSA B44.1/ASME A17.5 - Elevator and Escalator Electrical Equipment.

J. CSA - National Electric Code.

K.

2.2 VERTICAL PLATFORM WHEELCHAIR LIFTS

A. Manufacturers:
   1. Garaventa Lift; Genesis Opal - Unenclosed Vertical Platform Lift: www.garaventalift.com/#sle.

B. Vertical Platform Wheelchair Lifts: Provide manufacturer's standard type that complies with indicated requirements. Use manufacturer's standard components for vertical platform wheelchair lifts as required for complete system unless otherwise indicated.
   1. Location:
      a. Interior of building, as indicated on drawings.
   2. Lift Load Capacity: 750 lb (- kg), maximum.
   3. Lifting Height from Bottom to Upper Floor Level: As indicated on drawings.
   4. Platform Side Wall Panels: Nominal height of 42 inches (1067 mm), with galvanized steel sheet panels, and enclosed within rectangular extruded aluminum framework.
   5. Platform Floor: Steel sheet with matte finish, having overall thickness not greater than 1-1/2 inches (38 mm).
   6. Drive System:
   7. Drive System Enclosure: Provide rectangular galvanized steel tube frame with flush steel sheet panels on sides and top to enclose drive system components; securely attach enclosure to adjacent substrate.

2.3 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics:

B. Electrical Components, Boxes, Conduit, Wiring, and Devices: Comply with NFPA 70 and UL (DIR) or ITS (DIR) listed and labeled, and marked as applicable for proposed locations.

2.4 MATERIALS

A. Rolled Steel Sections, Shapes, and Rods: Comply with ASTM A36/A36M.

B. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.

C. Rolled Steel Floor Plates: Comply with ASTM A786/A786M, 1/8 inch (3.2 mm) thick, with manufacturer's standard surface pattern; rolled from steel plate complying with ASTM A572/A572M, Grade 55 (380).

D. Steel Tubing: Comply with ASTM A500/A500M, cold formed.

E. Anchor Bolts and Rods: Comply with ASTM F1554, Grade 55.

F. Welding: Comply with applicable requirements of AWS D1.1/D1.1M and AWS D1.3/D1.3M.

G. Touch-Up Primer for Galvanized Surfaces: Zinc-rich type.

2.5 EQUIPMENT

A. Lubrication of Equipment: Provide grease fittings for lubricating bearings requiring periodic lubrication, automatic feed type grease cups, and visible and easily accessible lubrication points.

B. Guide Rails, Ropes, Counterweights, Sheaves, Attachment Brackets, and Anchors: Sized in accordance with local building code, including safety factors.

C. Maintenance Devices: Provide as necessary within wheelchair lift system, supported on structural members within accessible locations.

D. Emergency Alarm: Provide audible and visual alarm system that indicates emergency stop button on platform has been activated.

2.6 FINISHES

A. Baked-On Factory Finish for Structural Metal Surfaces: Clean surfaces of rust, oil, or grease and wipe clean with solvent; apply manufacturer's standard two-coat, baked-on finish consisting of primer and thermosetting top coat.

1. Color: Manufacturer's standard color.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that areas and conditions comply with installation tolerances and other conditions affecting this work.

B. Verify that locations for electrical rough-in connections to system equipment are in acceptable locations before installing equipment.

C. Verify that electrical power is available and of correct characteristics.

D. Verify that walls and floors for wheelchair lift areas are plumb and square, and properly sloped for drainage.

E. Do not proceed with installation until unacceptable conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces of substrates using methods in accordance with lift manufacturer's installation instructions.

B. Clean surfaces thoroughly before starting installation of lifts.

3.3 INSTALLATION

A. Install wheelchair lift system and components in accordance with manufacturer's written installation instructions.

B. Install wheelchair lift system securely to supporting structure, and flush with adjacent surfaces.

C. Install structural components using methods that comply with requirements indicated relative to layout and structural position.

3.4 ADJUSTING

A. Adjust wheelchair lift equipment to operate smoothly and safely.

B. Verify vertical travel of wheelchair lift system; adjust as necessary to maintain operating range indicated.

C. After installation, inspect exposed factory-finished wheelchair lift equipment and repair damaged finishes.

3.5 CLEANING

A. See Section 01 7000 - Execution for additional requirements.

B. Remove protective coverings from finished surfaces.

C. Clean surfaces and components.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for closeout submittals.

B. See Section 01 7900 - Demonstration and Training for additional requirements.

C. Demonstration: Demonstrate operation of wheelchair lift system to Brewster Central School District's personnel.

1. Use operation and maintenance data as a reference during the demonstration.
2. Briefly describe function, operation, and maintenance of each component.

D. Training: Train Brewster Central School District's personnel on operation and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's training personnel.
4. Location: At project site.

3.7 MAINTENANCE

A. See Section 01 7000 - Execution for additional requirements.

B. Perform maintenance work using competent personnel under supervision of wheelchair lift installer.

C. Examine monthly; clean, adjust, and lubricate equipment.

D. Repair, or replace parts when required with parts produced by original equipment manufacturer.

END OF SECTION

SECTION 221116
DOMESTIC WATER PIPING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide Domestic water piping in accordance with the Contract Documents." The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

B. Section Includes:

1. Aboveground & below grade domestic water pipes, tubes, fittings, and specialties inside the building.

1.2 PERFORMANCE REQUIREMENTS

Revise this article to indicate specific loads determined by Project's structural engineer or see loads indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Verify requirements of authorities having jurisdiction.

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.3 SUBMITTALS

First two paragraphs below are defined in Division 01 Section "Submittal Procedures" as "Action Submittals."

A. Product Data: For the following products:

1. Specialty valves.
2. Transition fittings.
3. Dielectric fittings.
4. Flexible connectors.
5. Escutcheons.
6. Sleeves and sleeve seals.
7. Water penetration systems.
8. Pre-insulated PEX tube and fittings.

Retain first paragraph below if Drawings do not include detailed plans or if Project involves unusual coordination requirements.

B. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

Revise subparagraphs below to suit Project.

1. Domestic water piping.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

Retain first paragraph below if plastic piping materials are retained.

1.5 COORDINATION

Retain this article if large water meters will be mounted on concrete bases.

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

See "Writing Guide" Article in the Evaluations for a discussion of how this Section is organized and the most efficient way to edit this Section. See "Piping Materials and Standards" Article in the Evaluations for a discussion of piping materials covered by referenced standards.

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

Tube in first paragraph below is available in NPS 1/8 to NPS 12 (DN 6 to DN 300).

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

Fittings in first subparagraph below are available in NPS 1/4 to NPS 12 (DN 8 to DN 300).

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.

Fittings in first subparagraph below are available in NPS 1/4 to NPS 8 (DN 8 to DN 200).

2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

Flanges in first subparagraph below are available in NPS 1/2 to NPS 12 (DN 15 to DN 300).

3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

Unions in first subparagraph below are available in NPS 1/4 to NPS 4 (DN 8 to DN 100).

4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

Fittings in first subparagraph below are available in NPS 1/2 to NPS 4 (DN 15 to DN 100).

5. Copper Pressure-Seal-Joint Fittings:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Division 01 Section "Product Requirements."

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) Elkhart Products Corporation; Industrial Division.
2) NIBCO INC.
3) Viega; Plumbing and Heating Systems.

b. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.

c. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

Fittings in first subparagraph below are available in NPS 1/2 to NPS 2 (DN 15 to DN 50).

Extruded-tee connections in first subparagraph below can be used instead of tee fittings in copper tubing; delete if prohibited.

6. Copper-Tube Extruded-Tee Connections:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Division 01 Section "Product Requirements."

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) T-DRILL Industries Inc.

b. Description: Tee formed in copper tube according to ASTM F 2014.

Tube in paragraph below is available in NPS 1/8 to NPS 12 (DN 6 to DN 300).

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

Unions in first paragraph below are available in at least NPS 1/2 to NPS 2 (DN 15 to DN 50).

B. Dielectric Unions:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Division 01 Section "Product Requirements."

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 or approved equal:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

Revise pressure rating and temperature in first subparagraph below to suit Project, or insert other options for specific applications.

   a. Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
   b. End Connections: Solder-joint copper alloy and threaded ferrous.

Flanges in first paragraph below are available in at least NPS 1-1/2 to NPS 4 (DN 40 to DN 100).

C. Dielectric Flanges:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Division 01 Section "Product Requirements."

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 or approved equal:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Factory-fabricated, bolted, companion-flange assembly.

Revise pressure rating in first subparagraph below to suit Project, or insert other options for specific applications.

   b. Pressure Rating: 175 psig (1200 kPa) minimum.
   c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

Flanges in first paragraph below are available in at least NPS 1/2 to NPS 48 (DN 15 to DN 1200).

Couplings in first paragraph below are available in at least NPS 1/2 to NPS 3 (DN 15 to DN 80).

D. Dielectric Couplings:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Division 01 Section "Product Requirements."

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 or approved equal:

   a. Calpico, Inc.
   b. Lochinvar Corporation.

2. Description:

   a. Galvanized-steel coupling.

Revise pressure rating and temperature in first subparagraph below to suit Project.

   b. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
   c. End Connections: Female threaded.
   d. Lining: Inert and noncorrosive, thermoplastic.

Nipples in paragraph below are available in at least NPS 1/2 to NPS 4 (DN 15 to DN 100).

E. Dielectric Nipples:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Division 01 Section "Product Requirements."

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 or approved equal:

   a. Perfection Corporation; a subsidiary of American Meter Company.
   b. Precision Plumbing Products, Inc.
   c. Victaulic Company.

2. Description:

   a. Electroplated steel nipple complying with ASTM F 1545.
   b. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
   c. End Connections: Male threaded or grooved.
   d. Lining: Inert and noncorrosive, propylene.

Retain first paragraph below for combined domestic and fire-protection water service.

2.5 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated or rough-brass finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew or spring clips.

E. Split Casting, Cast Brass: Polished, chrome-plated or rough-brass finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew or spring clips.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.6 SLEEVES

Wall-pipe sleeves in first paragraph below are available with many end variations.

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

PVC sleeves in first two paragraphs below may be prohibited by fire authorities having jurisdiction.

D. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

E. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

F. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

Sleeve in paragraph below is without seepage holes and cannot be used as a replacement for a floor drain.

G. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

Retain subparagraph below if required.

1. Underdeck Clamp: Clamping ring with setscrews.

2.7 SLEEVE SEALS

Retain this article if sleeve seals are required; if retaining, delete "Wall Penetration Systems" Article.

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. See Division 01 Section "Product Requirements."

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 or approved equal:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

Retain "EPDM-rubber" option in first subparagraph below unless NBR gasket material is required because hydrocarbons are present in the soil.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

See "Writing Guide" Article in the Evaluations for a discussion of how this Section is organized and the most efficient way to edit this Section.

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified. If Drawings are explicit enough, these requirements may be reduced or omitted.

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install shutoff valve immediately upstream of each dielectric fitting.

Retain first paragraph below if booster pumps are not required.

C. Install domestic water piping level and plumb.

Retain first paragraph below if water meters are inside the building.

Retain first paragraph below if piping is required to withstand seismic design loads.

D. Install seismic restraints on piping.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping adjacent to equipment and specialties to allow service and maintenance.

I. Install piping to permit valve servicing.

J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Retain first paragraph below if hot-water circulation pumps are controlled by thermostats.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

A. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have

supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

NPS 1/2 or NPS 3/4 (DN 15 or DN 20) inlet hose-end drain valves may be adequate for application in first paragraph below.

Retain one of two paragraphs below.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.6 HANGER AND SUPPORT INSTALLATION

Retain first paragraph below if Project is in a seismic area.

A. Hangers and Supports for Plumbing Piping and Equipment.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet (30 m) If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.

E. Install supports for vertical copper tubing every 10 feet (3 m).

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32) and Smaller: 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.

G. Install supports for vertical steel piping every 15 feet (4.5 m).

H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified. If Drawings are explicit enough, these requirements may be reduced or omitted.

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.9 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

G. Seal space outside of sleeves in concrete slabs and walls with grout.

Revise first paragraph below as required for seismic design conditions. Coordinate sleeve requirements with pipe insulation specified in Division 22 Section "Plumbing Insulation."

H. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

I. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.

    a. Extend sleeves 2 inches (50 mm) above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. PVC pipe sleeves for pipes smaller than NPS 6 (DN 150).
    b. Galvanized-steel sheet sleeves for pipes NPS 6 (DN 150) and larger.
    c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Interior Concrete Walls:

    a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).

J. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Penetration Firestopping" for firestop materials and installations.

3.10 SLEEVE SEAL INSTALLATION

If retaining this article, delete "Wall Penetration System Installation" Article. Sleeve seals in this article are used in exterior concrete and masonry walls for a watertight seal around water-service piping entries into the building. These seals typically require installation in a sleeve for proper operation.

A. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 15 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

Retain first paragraph below to describe tests and inspections to be performed. Portions of testing and inspecting requirements in this article are taken from model plumbing codes. Verify requirements are applicable to location of this Project.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by the City of New York.
2. During installation, notify the City of New York at least one day before inspection must be made. Perform tests specified below in presence of the City of New York:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for the City of New York to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If the City of New York find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by the City of New York.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

See Division 01 Section "Quality Requirements" for retesting and reinspecting requirements. See Division 01 Section "Execution" for requirements for correcting the Work.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.13 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.

Retain first paragraph below if disinfection of non-potable domestic water piping is not required. If disinfection is required, delete first paragraph below and revise paragraph above.

3.14 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

Delete first paragraph below if prohibited.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

The "Piping Schedule" Article below is organized to first present the service and pipe size or size range; then to present optional piping materials and joining methods. Retain the services and sizes and size ranges applicable to the Project, then retain the selected piping materials and joining methods. Coordinate selection of piping materials and joining methods with piping materials described in Part 2.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained. Piping for this application matches exterior underground water service piping specified in Division 22 Section "Facility Water Distribution Piping."

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained. Piping for this application matches exterior underground water-service piping specified in Division 22 Section "Facility Water Distribution Piping."

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained. Piping for the application below matches exterior underground combined water-service and fire-service-main piping specified in Division 22 Section "Facility Water Distribution Piping."

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

D. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:

1. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and soldered joints.

3. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.
4. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper push-on-joint fittings; and push-on joints.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

Retain "one of" option in first paragraph below to allow Contractor to select piping materials from those retained.

Retain "one of" option in paragraph below to allow Contractor to select piping materials from those retained.

3.15 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 (DN 50) and smaller.
2. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

Delete paragraph below and use metal valves if temperature rating may be exceeded. Coordinate selection of "CPVC" or "PVC" option with "Specialty Valves" Article.

END OF SECTION 22 11 16

SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract the State of New York Standard Construction Contract.

B. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

C. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.

C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) ANACO.
2) Fernco, Inc.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) ANACO.
2) Clamp-All Corp.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

3. Heavy-Duty, Shielded, Cast-Iron Couplings: ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) MG Piping Products Co.

2.5 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.

B. Drainage Fittings: ASME B16.12, galvanized, threaded, cast-iron drainage pattern.

C. Pressure Fittings:

1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
4. Cast-Iron Flanges: ASME B16.1, Class 125.
5. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.

D. Grooved-Joint Systems:

1. Available Manufacturers:

    a. Anvil International.
    b. Star Pipe Products; Star Fittings Div.
    c. Victaulic Company.
    d. Ward Manufacturing, Inc.

2. Grooved-End, Steel-Piping Fittings: ASTM A 47/A 47M, galvanized, malleable-iron casting; ASTM A 106, galvanized-steel pipe; or ASTM A 536, galvanized, ductile-iron casting; with dimensions matching steel pipe.
3. Grooved-End, Steel-Piping Couplings: AWWA C606, for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

2.6 STAINLESS-STEEL PIPE AND FITTINGS

A. Pipe and Fittings: ASME A112.3.1, drainage pattern with socket and spigot ends.

B. Gaskets: Lip seals shaped to fit socket groove, with plastic backup ring.

1. Material: EPDM, unless NBR is indicated.

2.7 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end, unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end, unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

C. Grooved-Joint Systems:

1. Available Manufacturers:

    a. Victaulic Company.

2. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
3. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

D. Flanges: ASME 16.1, Class 125, cast iron.

2.8 SPECIAL PIPE FITTINGS

A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Available Manufacturers:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc.
c. Logan Clay Products Company (The).
d. Mission Rubber Co.
e. NDS, Inc.
f. Plastic Oddities, Inc.

2. Sleeve Materials:

a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
b. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Mission Rubber Co.

C. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Available Manufacturers:

a. EBAA Iron Sales, Inc.
b. Romac Industries, Inc.
c. Star Pipe Products; Star Fittings Div.

D. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Available Manufacturers:

a. SIGMA Corp.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Steel pipe, drainage fittings, and threaded joints.
4. Stainless-steel pipe and fittings, gaskets, and gasketed joints.
5. Copper DWV tube, copper drainage fittings, and soldered joints.

C. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Steel pipe, drainage fittings, and threaded joints.
4. Stainless-steel pipe and fittings gaskets, and gasketed joints.
5. Copper DWV tube, copper drainage fittings, and soldered joints.
    a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2 (DN 65 and DN 90): Hard copper tube, Type M (Type C); copper pressure fittings; and soldered joints.
6. Dissimilar Pipe-Material Couplings: Flexible, Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

D. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 (DN 40 and DN 50) shall be any of the following:

1. Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.
2. Steel pipe, pressure fittings, and threaded joints.

3.2 PIPING INSTALLATION

A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

C. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

3.4 VALVE INSTALLATION

A. Shutoff Valves: Install shutoff valve on each sewage pump discharge.

1. Install gate or full-port ball valve for piping NPS 2 (DN 50) and smaller.

2. Install gate valve for piping NPS 2-1/2 (DN 65) and larger.

B. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.5 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.

G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
5. NPS 3 (DN 80): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.

I. Install supports for vertical steel piping every 15 feet (4.5 m).

J. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 (DN 50): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 96 inches (2400 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 (DN 100): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.

K. Install supports for vertical stainless-steel piping every 10 feet (3 m).

L. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
3. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
4. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.

M. Install supports for vertical copper tubing every 10 feet (3 m).

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract the State of New York Standard Construction Contract.

B. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Roof flashing assemblies.
3. Through-penetration firestop assemblies.
4. Miscellaneous sanitary drainage piping specialties.
5. Flashing materials.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics.

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.
g. Josam Company; Blucher-Josam Div.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Cast-Iron Wall Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Square, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.2 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Acorn Engineering Company; Elmdor/Stoneman Div.
   b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-) thick, lead flashing collar and skirt extending at least 6 inches (150 mm) from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.3 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).
2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install roof flashing assemblies & fittings on sanitary stack vents and vent stacks that extend through roof.

F. Assemble open drain fittings and install with top of hub 2 inches (51 mm) above floor.

G. Install deep-seal traps on floor drains and other waste outlets, if indicated.

H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

J. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

K. Install vent caps on each vent pipe passing through roof.

L. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.

M. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.

N. Install wood-blocking reinforcement for wall-mounting-type specialties.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Secure flashing into sleeve and specialty clamping ring or device.

D. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

E. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

F. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221413
BUILDING STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide Facility storm drainage piping in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water (30 kPa).

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.3 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

C. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to building occupied by Edgemont School District or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify the Administrator no fewer than two days in advance of proposed interruption of storm-drainage service.
2. Do not proceed with interruption of storm-drainage service without the Administrator written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) ANACO.
2) Fernco, Inc.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) ANACO.
2) Clamp-All Corp.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.

B. Drainage Fittings: ASME B16.12, galvanized, threaded, cast-iron drainage pattern.

2.4 SPECIAL PIPE FITTINGS

A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Available Manufacturers:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc.

c. Logan Clay Products Company (The).
d. Mission Rubber Co.
e. NDS, Inc.
f. Plastic Oddities, Inc.

2. Sleeve Materials:

a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
b. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Mission Rubber Co.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 (DN 150) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and coupled joints.
3. Steel pipe, drainage fittings, and threaded joints.

3.2 PIPING INSTALLATION

A. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

C. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

D. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

E. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.4 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports for Plumbing Piping and Equipment. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
2. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
3. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
4. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).

E. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
2. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
3. NPS 3 (DN 80): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
4. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.

G. Install supports for vertical steel piping every 15 feet (4.5 m).

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to area drains and storm drainage specialties.

3.6 FIELD QUALITY CONTROL

A. During installation, notify the State of New York at least 24 hours before inspection must be made. Perform tests specified below in presence of the State of New York.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection State of New York to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If State of New York find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by the State of New York.

D. Test storm drainage piping according to procedures of State of New York or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders,] on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.7 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 14 13

SECTION 221423
STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide Storm drainage piping specialties in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Cleanouts.
2. Through-penetration firestop assemblies.
3. Roof drains.
4. Miscellaneous storm drainage piping specialties.
5. Flashing materials.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.4 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 ROOF DRAINS

A. Metal Area Drains RD-1, RD-2:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawing P-001 or a comparable product by one of the following or approved equal:

a. Olympic Manufacturing Group.
b. Portals Plus, Inc.
c. Thaler Metal Industries Ltd.
d. Josam Company; Josam Div.
e. Marathon Roofing Products.
f. MIFAB, Inc.
g. Portals Plus, Inc.
h. Prier Products, Inc.
i. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
j. Tyler Pipe; Wade Div.
k. Watts Drainage Products Inc.
l. Zurn Plumbing Products Group; Light Commercial Operation.
m. Zurn Plumbing Products Group; Specification Drainage Operation.
n. LSP Products Group, Inc.
o. Marathon Roofing Products.

p. Olympic Manufacturing Group.
q. Thaler Metal Industries Ltd.
r. Thunderbird Products.

2. Standard: ASME A112.21.2M.
3. Body Material: Cast iron.
4. Dimensions of Body: 15”.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Outlet: Bottom.
7. Underdeck Clamp: Required.

2.2 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm) thickness.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install area drains at existing points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install area-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Set flashing on floors and roofs in solid coating of bituminous cement.

B. Secure flashing into sleeve and specialty clamping ring or device.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 14 23

SECTION 230485

COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1) Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2) Verify and document proper performance of equipment and systems.
3) Verify that O&M documentation left on site is complete.
4) Verify that the Owner's operating personnel are adequately trained.

B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

C. Abbreviations. The following are common abbreviations used in this Specification and in the Commissioning Plan to be developed. Definitions are found in Section 1.6.

A/E-	Architect and design engineers	FT-	Functional performance test
CA-	Commissioning authority	GC-	General contractor (prime)
CC	Controls contractor	MC-	Mechanical contractor
CM-	Construction Manager (the owner's representative)	PC-	Prefunctional checklist
Cx-	Commissioning	PM-	Project manager (of the Owner)
Cx Plan-	Commissioning Plan document	Subs-	Subcontractors to General
EC-	Electrical contractor	TAB-	Test and balance contractor

1.2 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CA), the Project Manager (PM), , the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CA directs and coordinates the commissioning activities.

C. Scheduling. The CA will work with the Contractor according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the Contractor for scheduling commissioning activities. The Contractor will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The Contractor will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The *Commissioning Plan—Construction Phase* shall provide a format for this schedule. As construction progresses more detailed schedules are developed by the CA. The Commissioning Plan shall also provide a format for detailed schedules.

1.3 COMMISSIONING PROCESS

A. Commissioning Specifications. The commissioning specifications shall be provided as part of the bid documents and is binding on the Contractor. The commissioning plan provides guidance in the execution of the commissioning process. The CA shall present a preliminary *Commissioning Plan* for the Construction Phase at the pre-construction or initial commissioning coordination meeting. Just after the initial commissioning scoping meeting the CA will update the plan which is then considered the "final" plan, though it will continue to evolve and expand as the project progresses. The *Specifications* will take precedence over the *Commissioning Plan*.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
4. The CA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with prefunctional checklists to be completed, during the startup process.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.

6. The Subs, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment.
7. The CA develops specific equipment and system functional performance test procedures. The Subs review the procedures.
8. The procedures are executed by the Subs, under the direction of, and documented by, the CA.
9. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
10. The CA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion.
12. The CA reviews, pre-approves and coordinates the training provided by the Subs and verifies that is was completed.
13. Deferred testing is conducted, as specified or required.

1.4 RELATED WORK

A. Specific commissioning requirements shall be given in and/or amended to the following sections of these specifications. All of the following sections apply to the Work of this section.

15900 Instrumentation and Control for HVAC Lists special requirements and alerts the controls contractor of the special requirements of the control contractor and control system.

15950 Testing, Adjusting and Balancing (TAB). Alerts the TAB of Cx responsibilities.

1.5 RESPONSIBILITIES

A. Commissioning Authority (CA)

The CA (if not also the designer) is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving of non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CA.

Construction and Acceptance Phase

1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the Contractor, ensure that commissioning activities are being scheduled into the master schedule.
3. Develop and revise, as necessary, the *Commissioning Plan—Construction Phase.*
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.

5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and approve normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute prefunctional tests and checklists.
9. Develop an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owners project manager of any deficiencies in results or procedures.
12. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
13. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
14. Approve systems startup by reviewing start-up reports and by selected site observation.
15. Review TAB execution plan.
16. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
17. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
18. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing. Submit to the A/E and PM for review, and for approval if required.
19. Analyze any functional performance trend logs and monitoring data to verify performance.
20. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved. Perform actual functional testing without contractors on any equipment so specified in Section 230800
21. Maintain a master deficiency and resolution log and a separate testing record. Provide the A/E and PM with written progress reports and test results with recommended actions.
22. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
23. Oversee and approve the training of the Owner's operating personnel.
24. Compile and maintain a commissioning record and building systems book(s).
25. Review and approve the preparation of the O&M manuals.
26. Provide a final commissioning report (as described in this section).

Warranty Period

1. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

2. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

B. Contractor

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and with the Contractor and CA ensure that commissioning activities are being scheduled into the master schedule.
2. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
3. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
4. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
5. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.
6. Coordinate the training of owner personnel.
7. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

Warranty Period

1. Ensure that Subs execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

C. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by the CA.
4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope and budget.
5. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
6. Review test procedures for equipment installed by factory representatives.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

Architect / Engineer (A/E) - the architect and engineering consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

Commissioning authority (CA) - an independent agent, not otherwise associated with the A/E team members or the Contractor. The CA directs and coordinates the day-to-day commissioning activities

Commissioning Plan - an overall plan, developed after bidding that provides the structure, schedule and coordination planning for the commissioning process.

Control system - the central building energy management control system (or DDC System).

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deferred Functional Tests - FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

Factory Testing - testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Owner-Contracted Tests - tests paid for by the Owner outside the GC's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.

Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

Project Manager (PM) - the contracting and managing authority for the owner over the design and/or construction of the project, a staff position.

Sampling. - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 019113, Part 3.6, F for details.

Seasonal Performance Tests - FT that are deferred until the system(s) will experience conditions closer to their design conditions.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Division 23 Specifications.(

Trending - monitoring using the building control system.

Vendor - supplier of equipment.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.7 SYSTEMS TO BE COMMISSIONED

A. All equipment depicted in mechanical equipment schedules and controls riser diagrams will be commissioned in this project.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CA.

C. Datalogging equipment and software required to test equipment will be provided by the CA, but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

E. Refer to Section 019113, Part 3.6 E for details regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Within 60 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CA. Information gathered from this

meeting will allow the CA to revise the *Commissioning Plan* to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will plan these meetings and will minimize unnecessary time being spent by Subs. For large projects, these meetings may be held monthly, until the final 3 months of construction when they may be held as frequently as one per week.

3.2 REPORTING

A. The CA will provide regular reports to the PM, depending on the management structure, with increasing frequency as construction and commissioning progresses. Standard forms are provided and referenced in the *Commissioning Plan.*

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report (about four to six pages, not including backup documentation) by the CA will be provided to the PM, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals.

3.3 SUBMITTALS

A. The CA will provide appropriate contractors with a specific request for the type of submittal documentation the CA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CA will be included by the Subs in their O&M manual contributions.

B. The Commissioning authority will review and approve submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning authority will notify the, PM or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.

C. The CA may request additional design narrative from the Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. These submittals to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CA will review and approve them.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.7, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and startup.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in Section 230800.

1. The CA develops, if necessary, the representative prefunctional checklists based on the examples provided in this Section 019113. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution. The checklists will be provided as part of the *Commissioning Plan – Construction Phase*.
2. These checklists and tests are provided by the CA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.
3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

   The full start-up plan could consist of something as simple as:
   a. The CA's prefunctional checklists.

b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
c. The manufacturer's normally used field checkout sheets.

4. The subcontractor submits the full startup plan to the CA for review and approval.
5. The CA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
6. The full start-up procedures and the approval form may be provided to the A/E or PM for review and approval, depending on management protocol.

D. Sensor and Actuator Calibration.

All field-installed temperature, relative humidity, CO_2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.

All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

Sensor Calibration Methods

All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

Sensors With Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA or 0 VDC is read by the ammeter/voltmeter. Repeat for the maximum temperature matching 20 mA or 10VDC to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

Critical Applications. For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

Tolerances, Standard Applications

Sensor	Required Tolerance (+/-)	Sensor	Required Tolerance (+/-)
Cooling coil, chilled and condenser water temps	0.4F	Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F	Relative humidity	2% of design
Hot water coil and boiler water temp	1.0F		
Outside air, space air, duct air temps	0.4F		
CO_2 monitor	0.1 % pts		
Pressures, air, water and gas	3% of design		

Valve and Damper Stroke Setup and Check
EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions.
Closure for heating coil valves (NO): Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. Restore to normal.

Closure for cooling coil valves (NC): Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. Restore to normal.

E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the, Contractor and CA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
2. The CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the A/E). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures shall be identified in the commissioning plan.
4. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.

5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
2. The CA reviews the report and submits either a non-compliance report or an approval form to the Sub or PM. The CA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the Contractor and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system to the Contractor using a standard form.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in backcharges to the responsible party. Refer to Part 3.7 herein for details.

3.5 PHASED COMMISSIONING

A. Phasing will be planned and scheduled, if necessary, in a coordination meeting of the CA, , mechanical, TAB and controls and the Contractor. Results will be added to the master and commissioning schedule.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in Section 019113, Part 1.7. The specific equipment and modes to be tested are found in the Division 23 Sections

C. The parties responsible to execute each test are listed with each test in Section 230800

D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in the Division 23 Sections.

E. Development of Test Procedures. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in Division 23, the CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the A/E for review, if requested.

The CA shall review owner-contracted, factory testing or required owner acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the *Specifications*. Redundancy of testing shall be minimized.

The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

The test procedure forms developed by the CA shall include (but not be limited to) the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique prefunctional checklist and start-up documentation ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified
9. Formulas used in any calculations
10. Required pre-test field measurements
11. Instructions for setting up the test.
12. Special cautions, alarm limits, etc.
13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
15. A section for comments
16. Signatures and date block for the CA

F. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers. Division 23 sections specify which methods shall be used for each test. The CA

may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the A/E. This may require a change order and adjustment in charge to the Owner. The CA will determine which method is most appropriate for tests that do not have a method specified.

2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.

   A common sampling strategy referenced in the *Specifications* as the "xx% Sampling—yy% Failure Rule" is defined by the following example.

   xx = the percent of the group of identical equipment to be included in each sample.
   yy = the percent of the sample that if failing, will require another sample to be tested.

   The example below describes a 20% Sampling—10% Failure Rule.

a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

G. Coordination and Scheduling. The Subs shall provide sufficient notice to the CA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the, Contractor. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

H. Test Equipment. Refer to Section 019113, Part 2.1 for test equipment requirements.

3.7 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the Contractor for review and approval. The CA will include the filled out forms in the O&M manuals.

B. Non-Conformance.

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the Contractor on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the PM.
4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.

a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
   1) The CA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CA submits the non-compliance reports to the Contractor for signature, if required. A copy is provided to the Sub and CA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CA.
   2) The CA reschedules the test and the test is repeated.

b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
   1) The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the GC and to the Sub representative assumed to be responsible.
   2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E.
   3) The CA documents the resolution process.
   4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

   a. The cost to retest a prefunctional or functional test, if the Contractor is responsible for the deficiency, shall be born by the Contractor.
   b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CA will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CA's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
   c. The time for the CA to direct any retesting required because a specific *prefunctional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the Contractor.
   d. Refer to the sampling section of 019113, Part 3.6 for requirements for testing and retesting identical equipment.

6. The Contractor shall respond in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
7. The CA retains the original non-conformance forms until the end of the project.
8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract

Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the A/E. In such case, the Contractor shall provide the A/E with the following:

a. Within one week of notification from the A/E, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the A/E within two weeks of the original notice.
b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
c. The A/E will determine whether a replacement of all identical units or a repair is acceptable.
d. Two examples of the proposed solution will be installed by the Contractor and the CA will test the installations for up to one week, upon which the A/E will decide whether to accept the solution. The Contractor will be responsible for the cost of such testing.
e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA, if necessary. The CA recommends acceptance of each test to the A/E using a standard form. The A/E gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.8. OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section 017823. Special requirements for the controls contractor and TAB contractor are found Section 230800

2. CA Review and Approval. Prior to substantial completion, the CA shall review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* and to verify compliance with the *Specifications*. The CA will communicate deficiencies in the manuals to the, PM or A/E, as requested. Upon a successful review of the corrections, the CA recommends approval and acceptance of these sections of the O&M manuals to the PM or A/E. The CA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

B. Commissioning Record in O&M Manuals.

1. The CA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the Contractor, to be included with the O&M manuals. Three copies of the manuals will be provided. The format of the manuals shall be:

Tab I-1 Commissioning Plan
Tab I-2 Final Commissioning Report (see (B.2) below)
Tab 01 System Type 1 (chiller system, packaged unit, boiler system, etc.)
Sub-Tab A Design narrative and criteria, sequences, approvals for Equipment 1

Sub-Tab B Startup plan and report, approvals, corrections, blank prefunctional checklists

Colored Separator Sheets—for each equipment type (fans, pumps, chiller, etc.)

Sub-Tab C Functional tests (completed), trending and analysis, approvals and corrections, training plan, record and approvals, blank functional test forms and a recommended recommissioning schedule.
Tab 02 System Type 2.....repeat as per System 1

2. Final Report Details. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent, and 5) Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3. Other documentation will be retained by the CA.

3.9 TRAINING OF OWNER PERSONNEL

A. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.
B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CA shall decide how rigorous the training should be for each piece of commissioned equipment. The CA shall communicate the results to the Subs and vendors who have training responsibilities.
2. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in Divisions 23 and 26. .
3. Each Sub and vendor responsible for training will submit a written training plan to the CA for review and approval prior to training. The plan will cover the following elements:
   a. Equipment (included in training)
   b. Intended audience

c. Location of training
d. Objectives
e. Subjects covered (description, duration of discussion, special methods, etc.)
f. Duration of training on each subject
g. Instructor for each subject
h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
i. Instructor and qualifications

4. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
5. The CA develops an overall training plan and coordinates and schedules, with the Contractor, the overall training for the commissioned systems. The CA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CA recommends approval of the training to the A/E using a standard form. The PM also signs the approval form.
6. At one of the training sessions, the CA will give a presentation discussing the use of the blank functional test forms for re-commissioning equipment.
7. Video taping of the training sessions will be provided by the CA with tapes cataloged by the CA and added to the O&M manuals.
8. The mechanical design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall include a review of all systems using the simplified system schematics (one-line drawings).

3.10 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the A/E. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) of heating or refrigeration equipment shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

3.11 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the *Specifications.* The *Commissioning Plan—Construction Phase,* lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

Product	Developed By

1.	Final commissioning plan	CA
2.	Meeting minutes	CA
3.	Commissioning schedules	CA with Contractor
4.	Equipment documentation submittals	Subs
5.	Sequence clarifications	Subs and A/E as needed
6.	Prefunctional checklists	CA (already in Specs)
Product		Developed By
7.	Startup and initial checkout plan	Subs and CA (compilation of existing documents)
8.	Startup and initial checkout forms filled out	Subs
9.	Final TAB report	TAB
10.	Issues log (deficiencies)	CA
11.	Commissioning Progress Record	CA
12.	Deficiency reports	CA
13.	Functional test forms	CA
14.	Commissioning Specifications	CA
15.	Filled out functional tests	CA
16.	O&M manuals	Subs
17.	Commissioning record book	CA
18.	Overall training plan	CA
19.	Specific training agendas	Subs
20.	Final commissioning report	CA
21.	Misc. approvals	CA

END OF COMMISSIONING REQUIREMENTS

SECTION 230500

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide basic mechanical materials and methods in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:
   1. HVAC demolition.
   2. Equipment installation requirements common to equipment sections.
   3. Painting and finishing.
   4. Concrete bases.
   5. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

PART 2 - EXECUTION

2.1 HVAC DEMOLITION

A. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
   1. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   2. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
   3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to the City of New York.

B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

2.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

2.3 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 9 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

2.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

2.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

2.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

END OF SECTION

SECTION 230517

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves without waterstop.
2. Sleeves with waterstop.
3. Sleeve-seal systems.
4. Grout.
5. Silicone sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES WITHOUT WATERSTOP

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends.

B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.

C. Steel Sheet Sleeves: ASTM A653/A653M, 0.0239-inch minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

D. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

2.2 SLEEVES WITH WATERSTOP

A. Description: Manufactured PVC/HDPE, sleeve-type, waterstop assembly, made for imbedding in concrete slab or wall.

B. Description: Manufactured, Dura-coated or Duco-coated cast-iron sleeve with integral cast flashing flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Designed to form a hydrostatic seal of 20 psig.
2. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000 psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
1. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.

B. Silicone, S, P, T, NT: Single-component, 25, pourable, movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant.
1. Standard: ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES - GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using [**grout**] [**or**] [**silicone sealant**], seal space around outside of sleeves.

3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal-system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
2. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.5 SLEEVE SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above and below Grade:

    a. Sleeves with waterstops.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

    a. Sleeves with waterstops.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs above Grade:

    a. Sleeves with waterstops.

4. Interior Walls and Partitions:

   a. Sleeves without waterstops.

END OF SECTION 230517

SECTION 230519

METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide meter and gages for HVAC piping in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.

1.2 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

PART 2 - PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flo Fab Inc.
2. Miljoco Corporation.
3. Palmer Wahl Instrumentation Group.
4. Tel-Tru Manufacturing Company.
5. Trerice, H. O. Co.
6. Weiss Instruments, Inc.
7. Winters Instruments - U.S.

B. Standard: ASME B40.200.

C. Case: Cast aluminum; 9-inch (229-mm) nominal size unless otherwise indicated.

D. Case Form: Adjustable angle unless otherwise indicated

E. Glass with magnifying lens and blue or red organic liquid.

F. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).

G. Window: Glass.

H. Stem: Aluminum and of length to suit installation.

1. Design for Air-Duct Installation: With ventilated shroud.
2. Design for Thermowell Installation: Bare stem.

I. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.

J. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Standard: ASME B40.200.

B. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.

C. Material for Use with Copper Tubing: CNR.

D. Material for Use with Steel Piping: CRES.

E. Type: Stepped shank unless straight or tapered shank is indicated.

F. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.

G. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.

H. Bore: Diameter required to match thermometer bulb or stem.

I. Insertion Length: Length required to match thermometer bulb or stem.

J. Lagging Extension: Include on thermowells for insulated piping and tubing.

K. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

L. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 DIRECT-MOUNTED, METAL-CASE, DIAL-TYPE PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMETEK, Inc.; U.S. Gauge Div.

2. Ashcroft Inc.
3. Ernst Flow Industries.
4. Flo Fab Inc.
5. Marsh Bellofram.
6. Miljoco Corporation.
7. Noshok.
8. Palmer Wahl Instrumentation Group.
9. REOTEMP Instrument Corporation.
10. Tel-Tru Manufacturing Company.
11. Trerice, H. O. Co.
12. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
13. Weiss Instruments, Inc.
14. WIKA Instrument Corporation - USA.
15. Winters Instruments - U.S.

B. Standard: ASME B40.100.

C. Case: Sealed type; cast aluminum or drawn steel; 4-1/2-inch (114-mm) nominal diameter.

D. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.

E. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

F. Movement: Mechanical, with link to pressure element and connection to pointer.

G. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).

H. Pointer: Dark-colored metal.

I. Window: Glass.

J. Ring: Metal, brass, or stainless steel.

K. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Siphons: Loop-shaped section of brass or stainless-steel pipe with NPS 1/4 or NPS 1/2 (DN 8 or DN 15) pipe threads.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.

5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. Weiss Instruments, Inc.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F (minus 7 to plus 93 deg C) shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F (minus 35 to plus 136 deg C) shall be EPDM.

E. Test Kit: Furnish one test kit containing one pressure gage and adaptor, one thermometer, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch- (51- to 76-mm-) diameter dial and probe. Dial range shall be 0 to 200 psig (0 to 1380 kPa).
2. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F (minus 18 to plus 104 deg C).
3. Carrying case shall have formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

I. Install remote-mounted pressure gages on panel.

J. Install valve in piping for each pressure gage for fluids (except steam).

K. Install valve and syphon fitting in piping for each pressure gage for steam.

L. Install test plugs in piping tees.

M. Install liquid-in-glass thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic coil in air-handling units.
3. Outside-, return-, supply-, and mixed-air ducts.

N. Provide the following temperature ranges for thermometers:

1. Heating Hot Water: 0 to 250 deg F (0 to 150 deg C).
2. Condenser Water: 0 to 150 deg F (Minus 20 to plus 70 deg C).
3. Chilled Water: 0 to 150 deg F (Minus 20 to plus 70 deg C).
4. Air Ducts: Minus 40 to plus 110 deg F (Minus 40 to plus 45 deg C).

O. Install dial-type pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Suction and discharge of each pump.

P. Provide the following scale ranges for pressure gages:

1. Heating Hot Water: 0 to 100 psi (0 to 600 kPa).

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION

SECTION 23 0523

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide general- duty valves for HVAC piping in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Bronze ball valves.
2. Iron, single-flange lug-style butterfly valves.
3. High-performance butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Bronze gate valves.
7. Iron gate valves.
8. Bronze globe valves.
9. Iron globe valves.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.3 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.5 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 angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller.
4. Locking Lever Handle: For butterfly valves NPS 6 (DN 150) and smaller.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Red-White Valve Corporation.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).

c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 IRON, SINGLE-FLANGE LUG-STYLE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Lug-Style Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Cooper Cameron Valves; a division of Cooper Cameron Corp.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

B. 200 CWP, Iron, Single-Flange Lug-Style Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Cooper Cameron Valves; a division of Cooper Cameron Corp.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: NBR.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Aluminum bronze.

C. 200 CWP, Iron, Single-Flange Lug-Style Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Conbraco Industries, Inc.; Apollo Valves.
   b. Cooper Cameron Valves; a division of Cooper Cameron Corp.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. Mueller Steam Specialty; a division of SPX Corporation.
   i. NIBCO INC.
   j. Red-White Valve Corporation.
   k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Stainless steel.

D. 200 CWP, Iron, Single-Flange Lug-Style Butterfly Valves with NBR Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Conbraco Industries, Inc.; Apollo Valves.
   b. Cooper Cameron Valves; a division of Cooper Cameron Corp.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. Mueller Steam Specialty; a division of SPX Corporation.
   i. NIBCO INC.

j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

2.4 HIGH-PERFORMANCE BUTTERFLY VALVES

A. Class 150, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper Cameron Valves; a division of Cooper Cameron Corp.
b. Crane Co.; Crane Valve Group; Flowseal.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Jamesbury; a subsidiary of Metso Automation.
f. Milwaukee Valve Company.
g. NIBCO INC.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 285 psig (1965 kPa) at 100 deg F (38 deg C).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

B. Class 300, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper Cameron Valves; a division of Cooper Cameron Corp.
b. Crane Co.; Crane Valve Group; Flowseal.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Jamesbury; a subsidiary of Metso Automation.
f. Milwaukee Valve Company.
g. NIBCO INC.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 720 psig (4965 kPa) at 100 deg F (38 deg C).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, or ductile iron.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

2.5 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE or TFE.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Composition.
h. Seat Ring: Bronze.
i. Disc Holder: Bronze.
j. Disc: PTFE or TFE.
k. Gasket: Asbestos free.

C. Class 250, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.

f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.

2.7 BRONZE GATE VALVES

A. Class 150, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Kitz Corporation.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.8 IRON GATE VALVES

A. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).

c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

B. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.

e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

B. Class 250, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 500 psig (3450 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service except Steam: Ball, butterfly, or globe valves.
4. Throttling Service, Steam: Butterfly or globe valves.
5. Pump-Discharge Check Valves:

a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with nonmetallic disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.5 VALVE APPLICATIONS

A. Heating-Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Lug Style 150-psig (1035-kPa) CWP rating, ferrous alloy, with EPDM liner.
6. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
7. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
8. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Dual-plate, wafer, Class 125 or 150 ferrous alloy.
9. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
10. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
11. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
12. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

B. Chilled-Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Lug Style 150-psig (1035-kPa) CWP rating, ferrous alloy, with EPDM liner.
6. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
7. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
8. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Dual-plate, wafer, Class 125 or 150 ferrous alloy.
9. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
10. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
11. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
12. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

C. Low-Pressure Steam Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.

3. Ball Valves, NPS 2 (DN 50) and Smaller: Three-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
6. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
7. Gate Valves, NPS 2 (DN 50) and Smaller: Type 3, Class 150, bronze.
8. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
9. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
10. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

D. Steam Condensate Piping: Use the following types of valves:

1. Ball Valves, NPS 2 (DN 50) and Smaller: Three-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
3. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 200, bronze.
4. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
5. Gate Valves, NPS 2 (DN 50) and Smaller: Type 3, Class 200, bronze.
6. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
7. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 200, bronze.
8. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.
9. Plug Valves, NPS 2 (DN 50) and Larger: Class 125 or 150, lubricated-type, cast iron.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. Related Sections:

1. Section 05 5000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 23 3113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.
    g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc or Hot-dipped galvanized.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International; a subsidiary of Mueller Water Products Inc.
    b. Empire Industries, Inc.
    c. ERICO International Corporation.
    d. Haydon Corporation; H-Strut Division.
    e. NIBCO INC.
    f. PHD Manufacturing, Inc.
    g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger

and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 0548

VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide vibration controls for HVAC piping and equipment in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Isolation pads.
2. Isolation mounts.
3. Freestanding spring isolators.
4. Elastomeric hangers.
5. Spring hangers.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

B. Shop Drawings: Include the following:

1. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

C. Welding certificates.

D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

A. Delegated-Design Submittal:

1. For each wind-load protection device, that is required by this Section or is indicated on Drawings, submit the following:

a. Wind-Load Restraint, and Vibration Isolation Base Selection: Select vibration isolators, wind-load restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data.

b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
c. Concrete Anchors and Inserts: Include calculations showing anticipated seismic and wind loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
f. Wind-Load Design Calculations: Submit all static and dynamic loading calculations prepared under "Wind-Load Design Calculations" Paragraph in "Performance Requirements" Article.
g. Qualified Professional Engineer: All designated-design submittals for seismic- and wind-restraint calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.

2. Wind Restraint Detail Drawing:

a. Design Analysis: To support selection and arrangement of wind restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
d. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply also with requirements in other Sections for equipment mounted outdoors.

3. All delegated-design submittals for wind-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.
4. Design Calculations for Vibration Isolation Devices: Calculate static and dynamic loading due to equipment weight and operating forces required to select proper vibration isolators, and to design vibration isolation bases.
5. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system was examined for excessive stress and that none exists.

2.2 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene or rubber.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

E. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

F. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits.

3.3 VIBRATION-CONTROL DEVICE INSTALLATION

A. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

B. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Commissioner if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Measure isolator deflection.
2. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust active height of spring isolators.

END OF SECTION

SECTION 230553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide identification for HVAC piping and equipment in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Valve tags.
6. Warning tags.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch or 1/8 inch thick, and having predrilled holes for attachment hardware.

2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch or 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially or fully cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size:

a. For insulated piping up to 1-inch diameter, 1-inch letters.
b. For insulated piping 1-inch to 2-inches diameter, 2-inch letters.
c. For insulated piping 2-inches to 6-inches diameter, 3-inch letters.
d. For insulated piping larger than 6-inches diameter, 4-inch letters.
e. For un-insulated piping up to 1-inch diameter, 1/2-inch letters.
f. For un-insulated piping 1-inch to 2-inches diameter, 1-inch letters.
g. For un-insulated piping 2-inches to 6-inches diameter, 2-inch letters.
h. For un-insulated piping larger than 6-inches diameter, 3-inch letters.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch or 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

E. Fasteners: Stainless-steel rivets or self-tapping screws.

F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

G. Self-Adhesive Duct Labels: Printed plastic with contact-type, permanent-adhesive backing.

H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch; stainless steel, 0.025-inch; aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Beaded chain.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Completely paint piping systems in mechanical rooms with the applicable background colors listed in the Pipe Label Color Schedule below.

B. Locate pipe labels and color bands where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures, on both sides of the penetration.
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. On piping above removable acoustical ceilings.
7. Spaced at maximum intervals of 30 feet (9 m) along each run. Reduce intervals to 15 feet (4.5 m) in areas of congested piping and equipment.
8. Color bands are to be the applicable background colors listed in the Pipe Label Color Schedule below.

C. Pipe Label Color Schedule:

1. Heating Water Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

2. Refrigerant Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3. Condensate Drain Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

A. Install plastic-laminated or self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Supply-air ducts:

a. Background Color: Green.
b. Letter Color: White.

2. Return- and mixed-air ducts:

a. Background Color: Green.
b. Letter Color: White.

3. Exhaust-, outside-, and relief-air ducts:

a. Background Color: Green.
b. Letter Color: White.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 30 feet (9 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Hot Water: 2 inches, round.
b. Refrigerant: 2 inches, round.

2. Valve-Tag Color:

a. Hot Water: Natural.
b. Refrigerant: Natural.

3. Letter Color:

a. Hot Water: Black.
b. Refrigerant: Black.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
   a. Constant-volume air systems.
   b. Variable volume air systems

2. Balancing Hydronic Piping Systems:

   a. Constant-flow hydronic systems.
   b. Primary-secondary hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 15 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 90 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

B. TAB Conference: Meet with Engineer, Construction Manager and Commissioning Authority on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer, Construction Manager.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate

equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine equipment and verify that they are accessible and their controls are connected and functioning.

J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

K. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or ASHRAE 111 or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
   1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
   2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS:

A. Install new clean air filters in the fan coil units.

B. Balance air systems using the slowest fan speed possible by leaving the most remote registers' dampers fully open.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure static pressure directly at the fan outlet plenum.
b. Measure inlet static pressure at the fan inlet plenum (filter plenum).

3. Measure static pressure across each component that makes up an air-handling unit and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, and any other operating mode to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.

3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

D. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

E. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
2. Verify that the system is under static pressure control.
3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:

a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
d. Adjust controls so that terminal is calling for minimum airflow.
e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
f. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of

full cooling to full heating. Note any deviation from design airflow or room pressure.

5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow, so that connected total matches fan selection and simulates actual load in the building.
    c. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
    d. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

6. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report any artificial loading of filters at the time static pressures are measured.

7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Balance the return-air ducts and inlets.
    b. Verify that terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit, and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls Contractor.
9. Verify final system conditions as follows:

    a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
    b. Re-measure and confirm that total airflow is within design.
    c. Re-measure final fan operating data, speed, volts, amps, and static profile.
    d. Mark final settings.

e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
f. Verify tracking between supply and return fans.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

    a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Engineer and comply with requirements in Section 232123 "Hydronic Pumps."

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 10 percent of design.

B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.

C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.

D. Set calibrated balancing valves, if installed, at calculated presettings.

E. Measure flow at all stations and adjust, where necessary, to obtain first balance.

F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

J. Check settings and operation of each safety valve. Record settings.

3.9 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

A. Balance the primary circuit flow first and then balance the secondary circuits.

3.10 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.11 PROCEDURES FOR BOILERS

A. Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.

3.12 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

3.13 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 5 percent.

3.14 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing

devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.15 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.

13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.

d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.

k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

G. Gas- Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

J. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.
    c. Apparatus used for test.
    d. Area served.
    e. Make.
    f. Number from system diagram.
    g. Type and model number.
    h. Size.
    i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Air velocity in fpm.
    c. Preliminary air flow rate as needed in cfm.
    d. Preliminary velocity as needed in fpm.
    e. Final air flow rate in cfm.
    f. Final velocity in fpm.
    g. Space temperature in deg F.

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

    a. System and air-handling-unit identification.
    b. Location and zone.
    c. Room or riser served.
    d. Coil make and size.
    e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Entering-water temperature in deg F.
    c. Leaving-water temperature in deg F.
    d. Water pressure drop in feet of head or psig.
    e. Entering-air temperature in deg F.
    f. Leaving-air temperature in deg F.

L. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.

c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.
d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

M. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.16 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Commissioning Authority.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Commissioning Authority.
3. Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

END OF SECTION 230593

SECTION 23 0715

HVAC DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.
3. Outdoor, exposed supply and return.

B. Related Sections:

1. Section 23 0716 "HVAC Equipment Insulation."
2. Section 23 0719 "HVAC Piping Insulation."
3. Section 23 3113 "Metal Ducts" for duct liners.

1.2 DEFINITIONS

A. ASJ: All-service jacket.

B. FSK: Foil, scrim, kraft paper.

C. FSP: Foil, scrim, polyethylene.

D. PVDC: Polyvinylidene chloride.

E. SSL: Self-sealing lap.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Attachment and covering of heat tracing inside insulation.
3. Insulation application at pipe expansion joints for each type of insulation.
4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Removable insulation at piping specialties, equipment connections, and access panels.
6. Application of field-applied jackets.
7. Application at linkages of control devices.
8. Field application for each equipment type.

C. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control inspection reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.
    c. Knauf Insulation; 1000-Degree Pipe Insulation.
    d. Manson Insulation Inc.; Alley-K.
    e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F (649 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ or ASJ-SSL. Factory -applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

J. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Knauf Insulation; Permawick Pipe Insulation.
    b. Owens Corning; VaporWick Pipe Insulation.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F (10 to 427 deg C).

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-97.
    b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.
    c. Marathon Industries, Inc.; 290.
    d. Mon-Eco Industries, Inc.; 22-30.
    e. Vimasco Corporation; 760.

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; Encacel.
   b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
   c. Marathon Industries, Inc.; 570.
   d. Mon-Eco Industries, Inc.; 55-70.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-10.
   b. Foster Products Corporation, H. B. Fuller Company; 35-00.
   c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
   d. Marathon Industries, Inc.; 550.
   e. Mon-Eco Industries, Inc.; 55-50.
   f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms (2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F (Minus 29 to plus 93 deg C).
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-52.
   b. Foster Products Corporation, H. B. Fuller Company; 81-42.
   c. Marathon Industries, Inc.; 130.
   d. Mon-Eco Industries, Inc.; 11-30.
   e. Vimasco Corporation; 136.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F (Minus 46 to plus 82 deg C).
4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76.
   b. Foster Products Corporation, H. B. Fuller Company; 30-45.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Pittsburgh Corning Corporation; Pittseal 444.
   f. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76-8.
   b. Foster Products Corporation, H. B. Fuller Company; 95-44.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following:

   a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms (0.013 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
6. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms (0.007 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

    a. Products: Subject to compliance with requirements, provide the following:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

8. Vinyl Jacket: UL-rated white vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).

1. Products: Subject to compliance with requirements, provide the following:

    a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto PVC Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; Metal Jacketing Systems.
    b. PABCO Metals Corporation; Surefit.
    c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
    b. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
    c. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
    d. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

    a. Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
    b. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
    c. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
    d. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.

7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms (0.013 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following:

a. Dow Chemical Company (The), Saran 540 Vapor Retarder Film.

F. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
    b. Compac Corp.; 130.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
    d. Venture Tape; 1506 CW NS.

2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    b. Compac Corp.; 120.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    d. Venture Tape; 3520 CW.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following:

    a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.

2. Width: 3 inches (75 mm).
3. Film Thickness: 4 mils (0.10 mm).
4. Adhesive Thickness: 1.5 mils (0.04 mm).
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch (10.1 N/mm) in width.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products; Bands.
    b. PABCO Metals Corporation; Bands.
    c. RPR Products, Inc.; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) or 3/4 inch (19 mm) wide with wing or closed seal.

3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) or 3/4 inch (19 mm) wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, [0.106-inch- (2.6-mm-)] [0.135-inch- (3.5-mm-)] diameter shank, length to suit depth of insulation indicated.

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) AGM Industries, Inc.; CWP-1.
        2) GEMCO; CD.
        3) Midwest Fasteners, Inc.; CD.
        4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, [0.106-inch- (2.6-mm-)] [0.135-inch- (3.5-mm-)] diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) AGM Industries, Inc.; CWP-1.
        2) GEMCO; Cupped Head Weld Pin.
        3) Midwest Fasteners, Inc.; Cupped Head.
        4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
        2) GEMCO; Perforated Base.
        3) Midwest Fasteners, Inc.; Spindle.

    b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
    c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
    d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
c. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
2) GEMCO; Press and Peel.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, galvanized-steel, aluminum, or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) GEMCO.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.062-inch (1.6-mm) soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ACS Industries, Inc.
b. C & F Wire.
c. Childers Products.
d. PABCO Metals Corporation.
e. RPR Products, Inc.

2.11 CORNER ANGLES

A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch (0.61 mm) thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) or 4 inches (100 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

C. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 07 Section "Through-Penetration Firestop Systems."

3.5 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by the Commissioner. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, supply-air ducts.
2. Indoor, outdoor-air ducts.
3. Indoor, exhaust-air ducts between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, duct and plenum insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.

B. All ductwork within 15 feet of a fan/blower shall be internal lined with 1” thick acoustic duct liner.

3.8 OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Exterior Ductwork: Internally insulate with 1” thick liner and cover with 1.5” rigid board insulation. Alternatively, omit lining and cover with 2” rigid board. Install weatherproof self-stick membrane following installation of insulation.

B. In addition to exterior treatment, all ductwork within 15 feet of a fan/blower shall be internal lined with 1” thick acoustic duct liner.

END OF SECTION

SECTION 230719

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide HVAC piping insulation in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.3 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Dual temperature water piping, indoors.

2. AC condensate piping, indoors.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.

1. Preformed Pipe Insulation Materials: 12 incheslong by NPS 2.
2. Sheet Form Insulation Materials: 12 inchessquare.
3. Jacket Materials for Pipe: 12 incheslong by NPS 2.
4. Sheet Jacket Materials: 12 inchessquare.
5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by commissioner. Use materials indicated for the completed Work.

1. Piping Mockups:

a. One 10-foot section of NPS 2 straight pipe.
b. One each of a 90-degree threaded, welded, and flanged elbow.
c. One each of a threaded, welded, and flanged tee fitting.
d. One NPS 2 or smaller valve, and one NPS 2-1/2 or larger valve.
e. Four support hangers including hanger shield and insert.
f. One threaded strainer and one flanged strainer with removable portion of insulation.

g. One threaded reducer and one welded reducer.
h. One pressure temperature tap.
i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify commissioner seven days in advance of dates and times when mockups will be constructed.
4. Obtain commissioner's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless commissioner specifically approves such deviations in writing.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.8 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.9 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products:

   a. Aeroflex USA, Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

2.2 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg Fwith an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.

3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating

cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

    a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by commissioner. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by commissioner, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Dual Temperature Water Supply and Return:
1. NPS 1-1/4” and Smaller: Flexible Elastomeric: 1/2 inchthick.
2. NPS 1- 1/2” to 6 inches: Flexible Elastomeric: 1 inchthick.
3. NPS 8” and larger: Flexible Elastomeric: 1-1/2 inchesthick.

B. AC Condensate Piping
1. All sizes: Flexible Elastomeric: 1 inchthick.

END OF SECTION

SECTION 23 0993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide sequence of operations for HVAC controls in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Control sequences for HVAC systems, subsystems, and equipment.

1.2 PACKAGED ROOFTOP UNITS

A. Fan shall run continuously during occupied periods. Outside air damper shall open to minimum position.

B. Energy recovery wheel (if equipped) shall operate according to factory control sequence.

C. During a call for cooling (ie. above 75°F), fan shall run factory and controller shall stage compressors to maintain space temperature setpoint. Hot water control valve shall be closed.

D. During a call for heat (ie. below 68°F),, fan shall run and BAS shall modulate steam control valve to maintain space temperature setpoint.

E. DEMAND CONTROL VENTILATION: When CO2 level in space exceeds setpoint (typ. 800 ppm), BAS shall gradually open outside air damper to bring level below setpoint. When CO2 level is within setpoint for 30 mins (adj.), damper shall gradually close. Exhaust fan/damper shall operate according to factory control sequence.

DCV system shall comply with all Appendix J requirements listed below.

F. ECONOMIZER MODE: During a call for cooling when outdoor air enthalpy is less than return air enthalpy, system shall enter economizer mode. Factory controller shall modulate outdoor air and return dampers to maintain space temperature setpoint. Exhaust air fan/damper shall operate according to factory control sequence.

G. Smoke detected at duct-mounted smoke damper shall stop fan, close OA damper and send alarm signal to fire alarm control panel

H. Activation of Emergency Wall Stop in kitchen area will stop supply fan, close outdoor air damper and send alarm to fire alarm system.

1.3 VRF FAN COIL UNITS AND HEAT PUMPS

A. System shall be capable of simultaneous heating and cooling. System mode shall automatically change over at individual zone thermostat.

B. During a call for cooling (ie. above 75°F), factory controller shall stage compressors at heat pump to maintain space temperature setpoint.

C. During a call for heat (ie. below 68°F), factory controller shall stage compressors at heat pump to maintain space temperature setpoint.

D. Outdoor heat pump unit compressor shall modulate as required to satisfy heating and/or cooling demands of connected fan coil units. Unit defrost cycle shall operate according to factory sequence.

1.4 ENERGY RECOVERY VENTILATORS

A. ERV fan shall run according to the occupancy schedule at BAS. ERV shall run when building is occupied and stop when building is unoccupied. Motorized dampers in ERV ducts shall be open when fan is running and closed when fan stops.

B. DELETED.

1.5 SERIES FAN POWERED VAV BOXES

1. Design airflow rates shall be as scheduled on plans:

   a. Zone maximum cooling airflow setpoint (Vcool-max)

   b. Zone minimum airflow setpoint (Vmin)

2. See 1.3B.2 for calculation of zone minimum outdoor airflow.

3. The occupied cooling minimum Vmin* shall be equal to Vmin except as follows:

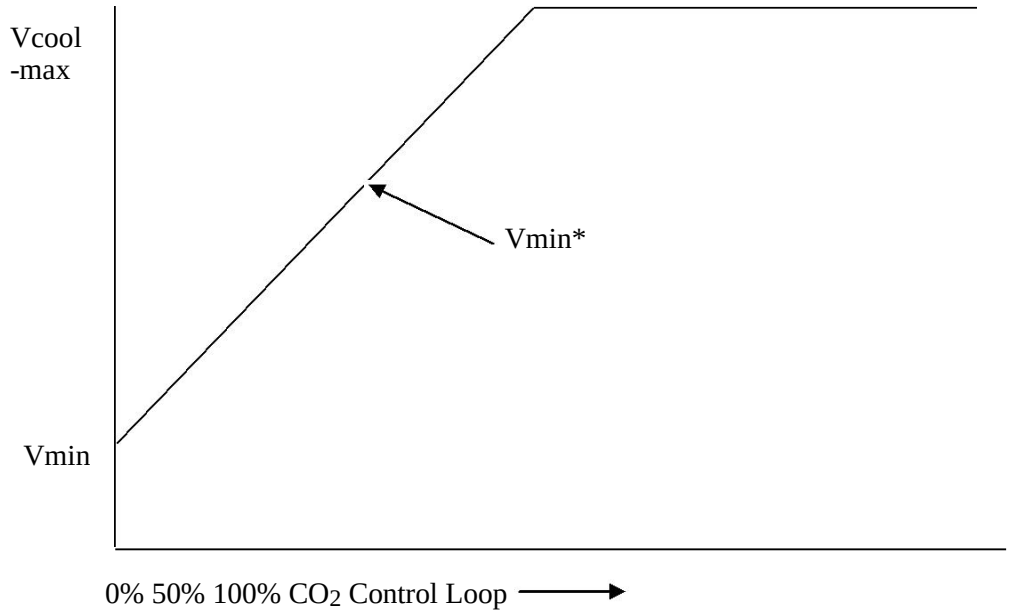
   a. If the zone has an occupancy sensor, Vmin* shall be equal to V_{oz} (if ventilation is according to ASHRAE Standard 62.1) when the room is unpopulated.

   b. If the zone has a window switch, Vmin* shall be zero when the window is open.

   c. If Vmin is non-zero and less than the lowest possible airflow setpoint allowed by the controls (Vm), Vmin* shall be set equal to Vm. The minimum setpoint Vm shall be determined in accordance with 1.3D.4.c.

   d. If the zone has a CO_2 sensor

1) During Occupied Mode, a P-only loop shall maintain CO_2 concentration at 1000 PPM; reset 0% at 800 PPM and 100% at 1,000 PPM of CO_2. The loop output from 0 to 50% shall reset the occupied minimum airflow setpoint (Vmin*) from the zone minimum airflow setpoint Vmin up to maximum cooling airflow setpoint Vcool-max, as shown below.



2) If ventilation outdoor airflow is controlled in accordance with California Title 24, the loop output from 50% to 100% will be used at the system level to reset outdoor air minimum; see AHU controls.

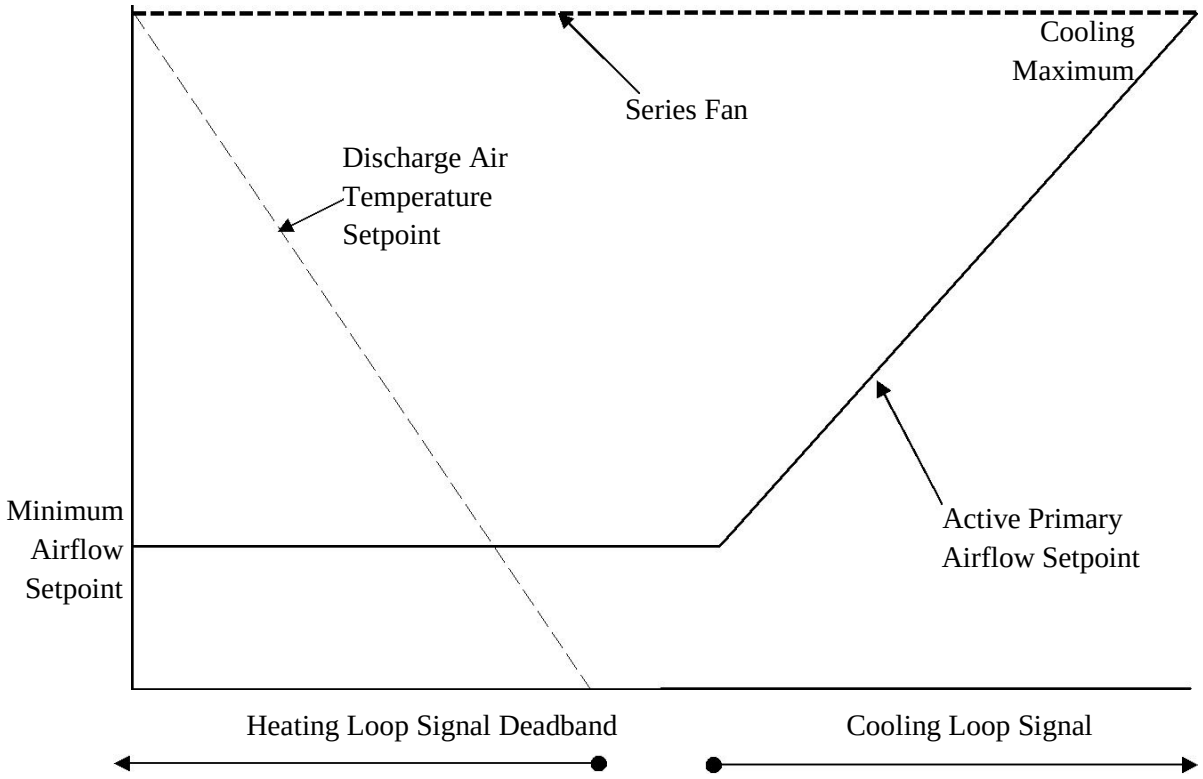
3) If ventilation outdoor airflow is controlled in accordance with ASHRAE Standard 62.1, the loop output from 50% to 100% shall be ignored.

4) Loop is disabled and output set to zero when the zone is not in Occupied Mode.

5. Active maximum and minimum setpoints shall vary depending on the Mode of the Zone Group the zone is a part of:

Setpoint	Occupied	Cool-down	Setup	Warm-up	Setback	Unoccupied
Cooling maximum	Vcool-max	Vcool-max	Vcool-max	0	0	0
Minimum	Vmin*	0	0	0	0	0

6. Control logic is depicted schematically in the figure below and described in the following sections.



a. When the zone is in Cooling, the Cooling Loop output shall be mapped to the primary airflow setpoint from the cooling maximum to the minimum airflow setpoints. Heating coil is off.

1) If supply air temperature from air handler is greater than room temperature, Cooling shall be locked out.

b. When the zone is in Deadband, the primary airflow setpoint shall be the minimum airflow setpoint. Heating coil is off.

c. When zone is in Heating

1) The Heating Loop shall reset the discharge temperature from the current AHU SAT setpoint to 90°F. Higher temperatures tend to cause air to stratify and bypass into the return air.

2) The hot water valve (or modulating electric heating coil) shall be modulated to maintain the discharge temperature at setpoint. (Directly controlling heating off zone temperature control loop is not acceptable.)

d. The VAV damper shall be modulated to maintain the measured airflow at setpoint.

e. Fan Control: Fan shall run whenever zone is in Occupied Mode. Prior to starting the fan, the damper is first driven fully closed to ensure that the fan is not rotating backwards. Once the fan is proven on for a fixed time delay (15 seconds), the damper override is released.

7. Alarms

a. Low Airflow

1) If the measured airflow is less than 70% of setpoint for 5 minutes, generate a Level 3 alarm.

2) If the measured airflow is less than 50% of setpoint for 5 minutes, generate a Level 2 alarm.

3) If a zone has an Importance multiplier of 0 [see 1.3A.11.b.1)a)] for its static pressure reset Trim & Respond control loop, low airflow alarms shall be suppressed for that zone.

b. Low Supply Air Temperature

1) If boiler plant is proven on and the supply air temperature is 15°F less than setpoint for 10 minutes, generate a Level 3 alarm.

2) If boiler plant is proven on and the supply air temperature is 30°F less than setpoint for 10 minutes, generate a Level 2 alarm.

3) If a zone has an Importance multiplier of 0 [see 1.3A.11.b.1)a)] for its HWST reset Trim & Respond control loop, low supply air temperature alarms shall be suppressed for that zone.

c. Fan alarm is indicated by the status input being different from the output command after a period of 15 seconds after a change in output status.

1) Commanded on, status off: Level 2

2) Commanded off, status on: Level 4

d. Airflow sensor calibration. If the fan serving the zone has been off for 10 minutes and airflow sensor reading is above 20 CFM, generate a Level 3 alarm.

8. Testing/Commissioning Overrides: Provide software points that interlock to a system level point to

a. Force zone airflow setpoint to zero

b. Force zone airflow setpoint to Vcool-max

c. Force zone airflow setpoint to Vmin

d. Force damper full closed/open

e. Force heating to off/closed

f. Turn fan on/off

g. Reset request-hours accumulator point to zero (provide one point for each reset type listed below)

9. System Requests

a. Cooling SAT Reset Requests

1) If the Cooling Loop is less than 85%, send 0 Requests.

1.6 ROOF EXHAUST FANS

A. Fan shall operate according to occupancy schedule at BAS.

1.7 ROOF GREASE EXHAUST FANS

A. Fan shall operate based on manual switch located at grease hood.

B. Fan speed shall vary based on signal from heat sensors located in hood.

C. Activation of hood-mounted fire suppression system shall stop grease exhaust and makeup air unit.

1.8 MAKEUP AIR UNIT WITH STEAM COIL

A. Fan shall be interlocked with grease exhaust fan. Fan shall run when grease fan is operating and stop when grease fan is idle.

B. Control system shall modulate steam coil control valve to maintain constant discharge air temperature of 65 deg F (adjustable).

C. Activation of Emergency Wall Stop in kitchen area will stop supply fan, close outdoor air damper and send alarm to fire alarm system.

1.9 CEILING AND WALL CABINET HEATERS

A. During a call for heat (ie. below 68°F), fan shall start. Steam control valve shall modulate to maintain space temperature setpoint.

APPENDIX J - MINIMUM REQUIREMENTS FOR DEMAND CONTROL VENTILATION

a. All air handling equipment are set up and capable of handling the volumetric flow rate of outside air at design day conditions for the maximum occupant load of the space(s) to receive DCV. Volumetric flow rate shall be determined using the "Mechanical Code"

b. Building pressures shall be maintained neutral or slightly positive during all occupied times.

c. Carbon monoxide detector(s) and alarm system are provided in at least one of the occupied spaces served by each indirect fuel fired heating unit to be controlled by DCV.

d. Radon testing during the first heating season, after installation, is required in al areas to receive DCV after installation. Testing will be performed by the District and results will be provided to NYS Department of Health and School District's Health and Safety Committee.

e. Direct digital controls are provided for all control devices serving the air handling systems to be controlled by variable volumetric flow rates of outside air.

REQUIREMENTS FOR DEMAND CONTROL VENTILATION USING SCHEDULED OCCUPANCY

a. Occupancy must be scheduled through building control system. In addition, occupancy may be overridden on by manual control.

b. CO_2 sensor must be provided to monitor occupant load.

c. Record keeping: Records to be provided to School District's Health and Safety Committee.

   1. Space CO_2 concentrations must be recorded at not greater than 15-minute intervals. Records of CO_2 concentrations must be kept for a minimum of three years.

   2. Air flow readings are required in accordance with Indoor Air Quality section of Part III Environment.

REQUIREMENTS FOR DEMAND CONTROL VENTILATION USING CO_2 SENSORS

a. Requirements applicable to all DCV systems shall also apply to those systems using CO_2 sensors.

b. Sensors shall have the following requirements:

1. Sensors must be located at points that are reflective of the breathing zone of each space served.

i. Sensor location(s) must avoid impact of doorways, windows, short circuiting, and supply air vents.

ii. An adequate number of CO_2 sensors have been provided for each space.

2. Sensor quality:

i. Error not to exceed 50 parts per million (ppm) in expected range of measurement.

ii. Drift not to exceed 20 ppm.

3. Redundant CO2 sensors have been provided at each location installed. If the difference in reading between sensors at the same location exceeds ten percent (10%), both sensors will require calibration.

4. Measurement of outside air CO_2 concentrations are not required. An assumed value of 350 ppm may be used in determining ambient CO_2 concentration.

5. Sensors shall take measurements (readings) in each space at intervals not to exceed 1 minute.

c. A minimum volumetric flow of outside air must be provided during occupied times.

1. Minimum flow rate must take into account dilution of non-occupant generated contaminants as well as make-up air requirements of all spaces served by the unit.

END OF SECTION

SECTION 232113

HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide hydronic piping in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1 Pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

a. Hot-water heating piping.
b. Condenser water piping.

B. Related Sections include the following:

1. Division 23 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.2 DEFINITIONS

A. PTFE: Polytetrafluoroethylene.

1.3 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 150 psig at 200 deg F.
2. Chilled water Piping: 150 psig at 60 deg F.

1.4 SUBMITTALS

A. Product Data: For each type of the following:

1. Manufactured, preinsulated, cased piping systems. Include carrier piping, insulation type and k-value, jacket, end seals, and major components for each cased piping system.
2. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves.
3. Air control devices.
4. Chemical treatment.
5. Hydronic specialties.

B. Shop Drawings: Detail the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the

building structure. Detail location of anchors, supports, alignment guides, and expansion joints and loops.

C. Welding certificates.

D. Qualification Data: For Installer.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

G. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1.6 EXTRA MATERIALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B).

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

C. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

D. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Hart Industries International, Inc.
    d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.

2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Factory-fabricated companion-flange assembly, for 150 minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Calpico, Inc.
    b. Lochinvar Corporation.

2. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F .

G. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Perfection Corporation; a subsidiary of American Meter Company.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Victaulic Company of America.

2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .

2.5 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "HVAC Instrumentation and Controls."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bell & Gossett Domestic Pump; a division of ITT Industries.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig .
10. Maximum Operating Temperature: 250 deg F .

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bell & Gossett Domestic Pump; a division of ITT Industries.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

E. Diaphragm-Operated, Pressure-Reducing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amtrol, Inc.
    b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    c. Conbraco Industries, Inc.
    d. Spence Engineering Company, Inc.
    e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Low inlet-pressure check valve.
8. Inlet Strainer: Bronze or brass, removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

F. Diaphragm-Operated Safety Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amtrol, Inc.
    b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    c. Conbraco Industries, Inc.
    d. Spence Engineering Company, Inc.
    e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.

5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Valve Seat and Stem: Noncorrosive.
9. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.6 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bell & Gossett Domestic Pump; a division of ITT Industries.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8 .
6. CWP Rating: 150 psig .
7. Maximum Operating Temperature: 225 deg F .

2.7 CHEMICAL TREATMENT

A. Bypass Chemical Feeder: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

B. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain water characteristics recommended by heat exchanger manufacturer.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot water heating piping, aboveground, NPS 2 and smaller, shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

B. Hot water heating piping, aboveground, NPS 2-1/2 and larger, shall be the following:

1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

C. Condenser water piping, aboveground, NPS 2-1/2" and smaller, shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

D. Condenser water piping, aboveground, NPS 3" and larger, shall be the following:

1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install triple-duty valves at each pump discharge to balance flow and control flow direction.

E. Install check valves at each pump discharge and elsewhere as required to control flow direction.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

K. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

L. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

M. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

N. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

O. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

S. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Basic Mechanical Materials and Methods."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Basic Mechanical Materials and Methods."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Basic Mechanical Materials and Methods."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 : Maximum span, 7 feet ; minimum rod size, 1/4 inch .
2. NPS 1 : Maximum span, 7 feet ; minimum rod size, 1/4 inch .
3. NPS 1-1/2 : Maximum span, 9 feet ; minimum rod size, 3/8 inch .
4. NPS 2 : Maximum span, 10 feet ; minimum rod size, 3/8 inch.
5. NPS 2-1/2 : Maximum span, 11 feet ; minimum rod size, 3/8 inch .
6. NPS 3 : Maximum span, 12 feet ; minimum rod size, 3/8 inch .
7. NPS 4 : Maximum span, 14 feet ; minimum rod size, 1/2 inch .
8. NPS 6 : Maximum span, 17 feet ; minimum rod size, 1/2 inch .

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 : Maximum span, 5 feet ; minimum rod size, 1/4 inch .
2. NPS 1 : Maximum span, 6 feet ; minimum rod size, 1/4 inch .
3. NPS 1-1/2 : Maximum span, 8 feet ; minimum rod size, 3/8 inch .
4. NPS 2 : Maximum span, 8 feet ; minimum rod size, 3/8 inch .
5. NPS 2-1/2 : Maximum span, 9 feet ; minimum rod size, 3/8 inch .
6. NPS 3 : Maximum span, 10 feet ; minimum rod size, 3/8 inch .

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install bypass chemical feeders in each hydronic system, in upright position with top of funnel not more than 48 inches (1200 mm) above the floor. Install feeder in minimum NPS 3/4 (DN 20) bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 (DN 20) pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

3.7 EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect manual air vents at high points of system and determine if all are installed and bleed air completely.
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers and heat pumps, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232116

HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydronic specialty valves.
2. Air-control devices.
3. Strainers.
4. Connectors.

B. Related Requirements:

1. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for expansion fittings and loops.
2. Section 230523.11 "Globe Valves for HVAC Piping" for specification and installation requirements for globe valves common to most piping systems.
3. Section 230523.12 "Ball Valves for HVAC Piping" for specification and installation requirements for ball valves common to most piping systems.
4. Section 230523.13 "Butterfly Valves for HVAC Piping" for specification and installation requirements for butterfly valves common to most piping systems.
5. Section 230523.14 "Check Valves for HVAC Piping" for specification and installation requirements for check valves common to most piping systems.
6. Section 230523.15 "Gate Valves for HVAC Piping" for specification and installation requirements for gate valves common to most piping systems.
7. Section 230923.11 "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Include construction details and material descriptions for hydronic piping specialties.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.
1. Body: Bronze or brass.
2. Disc: Glass and carbon-filled PTFE.
3. Seat: Brass.
4. Stem Seals: EPDM O-rings.
5. Diaphragm: EPT.
6. Low inlet-pressure check valve.
7. Inlet Strainer: Brass, removable without system shutdown.
8. Valve Seat and Stem: Noncorrosive.
9. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

B. Diaphragm-Operated Safety Valves: ASME labeled.
1. Body: Bronze or brass.
2. Disc: Glass and carbon-filled PTFE.
3. Seat: Brass.
4. Stem Seals: EPDM O-rings.
5. Diaphragm: EPT.
6. Wetted, Internal Work Parts: Brass and rubber.
7. Inlet Strainer: Brass, removable without system shutdown.
8. Valve Seat and Stem: Noncorrosive.
9. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

C. Automatic Flow-Control Valves:
1. Body: Brass or ferrous metal.
2. Flow Control Assembly, provide either of the following:

a. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
b. Elastomeric Diaphragm and Polyphenylsulfone Orifice Plate: Operating ranges within 2- to 80-psig differential pressure.

3. Combination Assemblies: Include bonze or brass-alloy ball valve.

4. Identification Tag: Marked with zone identification, valve number, and flow rate.
5. Size: Same as pipe in which installed.
6. Performance: Maintain constant flow within plus or minus 10 percent regardless of system pressure fluctuations.
7. Minimum CWP Rating: 175 psig.
8. Maximum Operating Temperature: 200 deg F.

2.2 AIR-CONTROL DEVICES

A. Manual Air Vents:
1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

B. Expansion Tanks:
1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested after taps are fabricated and shall be labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.
3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
4. Gage Glass: Full height with dual manual shutoff valves, 3/4-inch-diameter gage glass, and slotted-metal glass guard.

C. In-Line Air Separators:
1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
2. Maximum Working Pressure: Up to 175 psig.
3. Maximum Operating Temperature: Up to 300 deg F.

2.3 STRAINERS

A. Y-Pattern Strainers:
1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: Stainless-steel, [20] [40] [60]-mesh strainer, or perforated stainless-steel basket.

4. CWP Rating: 125 psig.

2.4 CONNECTORS

A. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.

D. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.

1. Install tank fittings that are shipped loose.
2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

E. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION 232116

SECTION 23 2300

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and refrigerant piping specialty.

B. Shop Drawings:

1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
2. Show interface and spatial relationships between piping and equipment.
3. Shop Drawing Scale: 3/8” equals 1 foot.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

G. Copper Pressure-Seal Fitting for Refrigerant Piping:
1. Standard: UL 207; certified by UL for field installation. Certification as a UL-recognized component alone is unacceptable.
2. Housing: Copper.
3. O-Rings: HNBR or compatible with specific refrigerant.
4. Tools: Manufacturer's approved special tools.
5. Minimum Rated Pressure: 700 psig.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:
1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.

6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:
1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).
1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.

4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 23 0923 "Direct Digital Control (DDC) System for HVAC" and Section 23 0993.11 "Sequence of Operations for HVAC DDC" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 08 3113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section 23 0553 "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 23 0517 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 23 0517 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 0518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic restraints in Section 23 0548 "Vibration and Seismic Controls for HVAC."

B. Comply with Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

D. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within 12 inches of each fitting.

F. 58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

G.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 3113

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Work Included: Provide metal ducts in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Duct Construction: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1.3 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.

5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Welding certificates.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Nexus Inc.
c. Ward Industries, Inc.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Lockformer.

2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 LISTED DUCTWORK FOR REMOVAL OF GREASE AND SMOKE LADEN VAPORS

1. Available Manufacturers:

a. Listed Double-Wall Insulated grease duct shall be model IPIC 2G grease duct manufactured by Metal-Fab, Inc

A. The grease duct shall be insulated double-wall factory –built type for use with Type I kitchen hoods, as described in NFPA-96 for the transportation of air and grease-laden vapors from commercial cooking operation.

B. Product Description:
   a. Metal-Fab Series 2G Grease Duct.
   b. Factory prefabricated, double wall type, listed for venting of grease laden air from kitchen hoods requiring grease duct as described in NFPA 96.
   c. Rated for continuous operation at 500° F and intermittent operation at 2000° F.
   d. All components of the grease duct system shall be provided by the manufacturer to ensure the system meets the requirements of the listing including duct supports, guides, fittings, cleanouts, and expansion joints required to install the duct.
   e. Grease duct shall be listed by the following agencies with the associated listed reports:
      i. UL 1978 (File MH8251) - Grease Ducts for Restaurant Cooking Appliances.
      ii. UL103HT (MH8251) - Standard for factory built chimneys and building heating appliances.
      iii. UL2221 (File R 15388) – Condition B – evaluated as an alternative to a 2 hour site-built and chased installation with 3 inches minimum clearance to a fully enclosed combustible construction.
   f. The duct sections shall be constructed of an inner wall and an outer wall with ceramic fiber insulation between the walls.
      i. The inner wall shall be constructed of 304, 316 or 430 stainless steel.
         1. 6 through 36 inch diameter materials: 0.035 inch thick inner wall.
         2. 38 through 48 inch diameter materials: 0.048 inch thick inner wall.
      ii. The outer wall shall be constructed of aluminized steel, 304 or 316 stainless steel.
         1. 6 thru 22 diameter inch materials: 0.024 inch thick outer wall.
         2. 24 thru 48 inch diameter materials: 0.034 thick outer wall.
      iii. The duct shall include a 2" thickness of body soluble ceramic fiber insulation between the inner and outer walls.
   g. The duct wall assembly is Tested and Listed to 1 inch clearance to combustibles for 6 inch to 18 inch diameters, 2 inches clearance to combustibles for 20 to 32 inch diameters, 3 inches clearance to combustibles for 34 to 42 inch diameters, 4 inches clearance to combustibles for 44 to 48 inch diameters.

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils (0.10 mm) thick.
3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.

D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

F. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: Black.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

G. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

H. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.5 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Maximum Thermal Conductivity:

a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
b. Johns Manville.
c. Knauf Insulation.

3. Minimum Thermal Conductivity (R-Value): 5.80.
4. Minimum Thickness: 1-1/2 inches.
5. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating.

Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

6. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel or stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.

4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. VOC: Maximum 395 g/L.
9. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
10. Service: Indoor or outdoor.
11. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes2-Inch wg (500 Pa) and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Fasteners appropriate for construction materials to which hangers are being attached.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.7 DUCT CLEANING

A. Clean new duct systems before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.

5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Rectangular Ducts Located in the Basement or in Crawl Spaces: PVC-coated, galvanized sheet steel with thicker coating on duct exterior.

B. Supply Ducts:

1. Pressure Class: Positive 2-inch wg (500 Pa).

C. Return Ducts:

1. Pressure Class: Positive or negative 2-inch wg (500 Pa).

D. Exhaust Ducts:

1. Pressure Class: Negative 2-inch wg (500 Pa).

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

F. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.
2. Return Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.
3. Exhaust Air Ducts: Fibrous glass, Type I, 1 inch thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

      1) Radius-to Diameter Ratio: 1.5.

   b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
   c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam or welded.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 3300

DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide duct accessories in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Manual volume dampers.
2. Control dampers.
3. Fire dampers.
4. Ceiling dampers.
5. Flange connectors.
6. Turning vanes.
7. Duct-mounting access doors.
8. Flexible connectors.
9. Duct accessory hardware.

B. Related Sections include the following:

1. Division 28 Section "Digital, Addressable Fire-Alarm System" for duct-mounting fire and smoke detectors.
2. Division 23 Section "HVAC Instrumentation and Controls" for damper actuators.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
e. Duct security bars.
f. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

D. Source quality-control reports.

E. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 EXTERIOR DUCT SILENCERS

A. Manufacturers:

1. Vibro Acoustics.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

C. Manufacturer's Responsibility: Silencer manufacturer shall have sole source responsibility for the design, factory fabrication and supply of all components and equipment as noted below. Provide silencers that are a product of an equipment manufacturer regularly engaged in the production of such product. Unit components and equipment fabricated and supplied by the contractor will not be permitted.

D. Manufacturer shall provide a written test report by a third party organization showing panel assemblies have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.

E.

1. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in other sections are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.
2. All casing seams and joints shall be lock-formed and sealed or stitch welded and sealed except as noted in Section G below, to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.
3. All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.
4. Fire-Performance Characteristics: Silencer assemblies, including acoustic media fill, Vibar™ film liner, sealants, and acoustical spacer, shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

F. Rectangular Silencers including models **EXTRD:** Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, 18 gauge.

G. Inner perforated metal liner: ASTM A 653/A 653M, G90 galvanized sheet steel.

1. Rectangular Silencers: 22 gauge.

H. Structural Support Steel: Structural steel shall be provided by the plenum or enclosure manufacturer so the maximum deflection of the assembled panels is L/180. Structural to structural steel connections shall be fully welded.

I. Provide flanged connections at silencer inlet and discharge.

J. Coordinate silencer dimensions with mating duct size. Coordinate length with sheet metal shop drawings.

K. Silencer performance (insertion losses) shall be as schedule on plans. Manufacturer to provide design data to certify performance.

L. Principal Sound-Absorbing Mechanism:

1. Dissipative:

a. Models **EXTRD** type with acoustic media. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.

M. HTL Casings: Where indicated on the silencer schedule, silencers shall have high transmission loss (HTL) walls externally applied and completely sealed to the silencer casing by the silencer manufacturer to assure quality controlled transmission loss. The HTL walls shall consist of media, airspace, mass and outer protective metal skin, as required, to obtain the specified room noise criteria. Standard acoustical panels will not be accepted as HTL walls. If requested by the Engineer, breakout noise calculations for each air handling and fan system shall be provided with the silencer submittal to insure compliance with the room noise criteria. Breakout noise calculations shall be based on the sound power levels of the specified equipment.

N. Source Quality Control: Test according to ASTM E 477-06a.

1. The manufacturer shall test the silencer(s) as indicated in the silencer schedule. The engineer shall be notified of the test date at least two weeks in advance and the test may be witnessed by the engineer. Test shall show compliance with the project criteria and is subject to engineer approval.

O. Test facilities and test reports shall be open to inspection upon request from the Engineer. Silencer performance must have been substantiated by laboratory testing according to ASTM E477-13 and so certified when submitted for approval. The aero-acoustic laboratory must be NVLAP accredited for the ASTM E477-13 test standard. A copy of the accreditation certificate must be included with the submittals. Data from non-NVLAP accredited test facilities will not be accepted

2.4 MANUAL VOLUME DAMPERS

A. Manufacturers:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Flexmaster U.S.A., Inc.
3. McGill AirFlow LLC.
4. METALAIRE, Inc.
5. Nailor Industries Inc.
6. Ruskin Company.
7. Trox USA Inc.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized sheet steel.

3. Blade Axles: Galvanized steel.
4. Tie Bars and Brackets: Galvanized steel.

D. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized sheet steel.
3. Blade Axles: Galvanized steel.
4. Blade Seals: Neoprene.
5. Tie Bars and Brackets: Galvanized steel.

E. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 CONTROL DAMPERS

A. Manufacturers:
1. Duro Dyne Inc.
2. Flexmaster U.S.A., Inc.
3. Greenheck Fan Corporation.
4. McGill AirFlow LLC.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Ruskin Company.
8. Vent Products Company, Inc.
9. Young Regulator Company.

B. General Description: AMCA-rated, opposed-blade design; minimum of 0.1084-inch- (2.8-mm) thick, galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch- (1.61-mm) thick, galvanized-steel damper blades with maximum blade width of 8 inches (203 mm).

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Provide parallel- or opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg (995 Pa) when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.6 FIRE DAMPERS

A. Manufacturers:
   1. Cesco Products; a division of Mestek, Inc.
   2. Greenheck Fan Corporation.
   3. McGill AirFlow LLC.
   4. METALAIRE, Inc.
   5. Nailor Industries Inc.
   6. NCA Manufacturing, Inc.
   7. Pottorff; a division of PCI Industries, Inc.
   8. Ruskin Company.

B. Fire dampers shall be labeled according to UL 555.

C. Fire Rating: 1-1/2 hours.

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

   1. Minimum Thickness: 0.052 or 0.138 inch thick as indicated and of length to suit application.
   2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Fusible Links: Replaceable, 165 deg F (74 deg C) rated.

2.7 CEILING DAMPERS

A. Manufacturers:
   1. Cesco Products; a division of Mestek, Inc.
   2. McGill AirFlow LLC.
   3. METALAIRE, Inc.
   4. Nailor Industries Inc.
   5. Ruskin Company.

B. General Description: Labeled according to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

D. Blades: Galvanized sheet steel with refractory insulation.

E. Fusible Links: Replaceable, 165 deg F (74 deg C) rated.

2.8 FLANGE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.9 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- (38-mm-) wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into vane runners suitable for duct mounting.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Duro Dyne Corp.
c. METALAIRE, Inc.
d. SEMCO Incorporated.
e. Ward Industries, Inc.; a division of Hart & Cooley, Inc

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.10 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:

a. American Warming and Ventilating; a division of Mestek, Inc.
b. Ductmate Industries, Inc.
c. Greenheck Fan Corporation.
d. McGill AirFlow LLC.
e. Nailor Industries Inc.
f. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Provide number of hinges and locks as follows:

   a. Less Than 12 Inches Square: Secure with two sash locks.
   b. Up to 18 Inches Square: Two hinges and two sash locks.
   c. Up to 24 by 48 Inches: Three hinges and two compression latches.
   d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.

1. Manufacturers:

   a. Ductmate Industries, Inc.
   b. Flexmaster U.S.A., Inc.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.11 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) or 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Select metal compatible with ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire dampers according to UL listing.

G. Connect ducts to duct silencers rigidly.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. At outdoor-air intakes and mixed-air plenums.
3. At drain pans and seals.
4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
5. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
6. At each change in direction and at maximum 50-foot (15-m) spacing.
7. Upstream or downstream from duct silencers.
8. Control devices requiring inspection.
9. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Install the following minimum sizes for duct-mounting, rectangular access doors:

1. As shown on Mechanical Details of Drawings.
2. One-Hand or Inspection Access: 12 by 12 inches.
3. Two-Hand Access: 12 by 12 inches.
4. Head and Hand Access: 16 by 20 inches.
5. Head and Shoulders Access: 16 by 20 inches.
6. Body Access: 24 by 24 inches.
7. Body Plus Ladder Access: 24 by 24 inches.

K. Install the following minimum sizes for duct-mounting, round access doors:

1. One-Hand or Inspection Access: 12 inches in diameter.
2. Two-Hand Access: 12 inches in diameter.
3. Head and Hand Access: 18 inches in diameter.
4. Head and Shoulders Access: 18 inches in diameter.
5. Body Access: 24 inches in diameter.

L. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

N. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect diffusers to ducts directly. Flexible duct is not permitted for this project.

P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 233423

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Roof fans.

1.3 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For unit hangars and supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
   1. Ceiling suspension assembly members.
   2. Size and location of initial access modules for acoustical tile.
   3. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
   1. Greenheck Fan Corporation.
   2. Loren Cook Company.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Steel or Aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Filter: Washable aluminum to fit between fan and grille.
7. Isolation: Rubber-in-shear vibration isolators.
8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.2 IN-LINE CENTRIFUGAL FANS

A. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
1. Greenheck Fan Corporation.
2. Loren Cook Company.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing,

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 0513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 FANS FOR GREASE EXHAUST

BELT DRIVE ROOF UPBLAST CENTRIFUGAL EXHAUST FANS - GREENHECK MODEL CUBE

A. General Description:
1. Discharge air up and away from the mounting surface.
2. Upblast fan shall be for roof mounted applications.
3. Performance capabilities up to 30,000 cubic feet per minute (cfm) and static pressure to 5 inches of water gauge.
4. Fans are available in fourteen sizes with nominal wheel diameters ranging from 9 inches through 48 inches (098 - 480 unit sizes).
5. Maximum continuous operating temperature is 400 Fahrenheit (204.4 Celsius).
6. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.

B. Wheel:
1. Material type: [aluminum] [non-stick coating]
2. Non-overloading, backward inclined centrifugal
3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency

C. Motors:
1. Motor enclosures: [Open drip-proof] [Totally enclosed fan cooled] [Explosion resistant enclosure]
2. Motors are heavy duty ball bearing type to match with the fan load and furnished at the specific voltage and phase.
3. Mounted on vibration isolators, out of the airstream
4. For motor cooling there shall be fresh air drawn into the motor compartment through an area free of discharge contaminants.
5. Accessible for maintenance

D. Shafts and Bearings:
1. Fan shaft shall be ground and polished solid steel with an anti corrosive coating
2. Permanently sealed bearings or pillow block ball bearings
3. Bearing shall be selected for a minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed
4. Bearings are 100 percent factory tested
5. Fan Shaft first critical speed is at least 25 percent over maximum operating speed

E. Housing:
1. Constructed of heavy gauge aluminum includes exterior housing, curb cap, windband, and motor compartment housing. Galvanized material is not acceptable.
2. Housing shall have a rigid internal support structure.
3. Windband to be one piece uniquely spun aluminum construction and maintain original material thickness throughout the housing.
4. Windband to include an integral rolled bead for strength.

5. Curb cap base to be fully welded to windband to ensure a leak proof construction. Tack welding, bolting, and caulking are not acceptable.
6. Curb cap to have integral deep spun inlet venturi and pre-punched mounting holes to ensure correct attachment to curb.
7. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.
8. Breather tube shall be 10 square inches in size for fresh air motor cooling, and designed to allow wiring to be run through it.

F. Vibration Isolation:
   1. Double studded or pedestal style true isolators
   2. No metal to metal contact
   3. Sized to match the weight of each fan

G. Disconnect Switches:
   1. NEMA rated: 3R
   2. Positive electrical shut-off
   3. Wired from fan motor to junction box installed within motor compartment

H. Drive Assembly
   1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower
   2. Belts: Static free and oil resistant
   3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts
   4. The motor pulley shall be adjustable for final system balancing
   5. Readily accessible for maintenance

I. Drain Trough:
   1. Allows for one-point drainage of water, grease, and other residues

J. Options/Accessories:
   1. Auto Belt Tensioner:
      a. Automatic tensioning device that adjusts for the correct belt tension, only for single drives.
   2. Birdscreen:
      a. Material Type: Aluminum
      b. Protects fan discharge
   3. Clean Out Port:
      a. Removable grease repellent compression rubber plug allows access for cleaning wheel through windband.
   4. Curb Extension:
      a. Material Type: Aluminum
      b. Coating: Baked Enamel
   5. Curb Seal:
      a. Types: High Temp Seal
      b. Typically mounted between the fan curb cap and the roof curb
   6. Dampers:
   7. Drain Connection:
      a. Constructed of aluminum
      b. Allows singe-point drainage of grease, water, or other residues

K. Finishes
      a. Types: Baked Enamel
   2. Grease Trap:
      a. Constructed of aluminum

   b. Includes drain connection
   c. Collects grease residue
   d. Optional with grease absorbent sock
3. Hinge Kit:
   a. Aluminum hinges
   b. Allows the fan to tilt away for access to wheel and ductwork for inspection and cleaning.
4. Hinge Base:
   a. Aluminum hinges
   b. Hinges and restraint cables are mounted to a base (sleeve)
   c. Allows the fan to tilt away for access to wheel and ductwork for inspection and cleaning.
5. Heat Baffle:
   a. 1 inch thick insulation shield that prevents heat from radiating into the motor compartment.
6. Roof Curbs:
   a. Mounted onto roof with fan
   b. Material: [Aluminum]
   c. Insulation thickness: 1.5 inches
   d. Coating Type: Baked Enamel
7. Tie-Down Points:
   a. Four brackets located on windband secures fan in heavy wind applications
8. Windband Extension:
   a. Constructed of aluminum with rolled beads
   b. Raises fan discharge an additional 36 inches'
9. Variable Frequency Drive
   a. Factory programed, mounted and wired
   b. Input speed control 0-10VDC
   c. 24VDC damper power output
   d. 24VDC control power output
   e. Motor: (VFD Rated) compatible with induction and permanent magnet motors
   f. Parameters of acquainted motor shall be set to include voltage, speed, FLA, acceleration/deceleration time, and minimum & maximum motor frequency
   g. R^3 Filtering for harmonic mitigation
   h. UL Recognized for 3 phase input
   i. NEMA 4X Enclosure
   j. LED indication for Power, Run, and Fault

2.5 SOURCE QUALITY CONTROL

C. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

D. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Equipment Mounting:
   1. Comply with requirements for vibration isolation and seismic control devices specified in Section 23 0548 "Vibration and Seismic Controls for HVAC."
   2. Comply with requirements for vibration isolation devices specified in Section 23 0548.13 "Vibration Controls for HVAC."

C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 07 7200 "Roof Accessories" for installation of roof curbs.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods.

F. Install units with clearances for service and maintenance.

G. Label units according to requirements specified in Section 23 0553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 23 3300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 23 0593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 233433

COMMERCIAL AIR CURTAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes commercial air-curtain unit.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For air curtain units.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittal: For air curtain units indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of air-curtain unit mounting assemblies.
2. Include design calculations for selecting vibration isolators.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 COMMERCIAL AIR-CURTAIN UNIT

2.2 Furnish and install a product by one of the following manufacturers:

1. Berner Inc.
2. Powered Aire.
3. Mars Corp.

B. Housing:

1. Galvanized Steel: Galvanized steel with electrostatically applied, epoxy-enamel, powder-coat finish.
2. Discharge Nozzle: Integral to housing, containing adjustable air-directional vanes with 40-degree sweep front to back.

C. Mounting Brackets: Galvanized steel, for [**wall**] [**ceiling**] mounting.

D. Air-Intake Grilles:

1. Grilles: Integral to, and same material as, housing.

E. Fans:

1. Centrifugal, forward curved, double width, double inlet.
2. Galvanized steel.
3. Statically and dynamically balanced.
4. Direct drive.

F. Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Multispeed.
3. Resiliently mounted.
4. Continuous duty.
5. Totally enclosed, air over.
6. Integral thermal-overload protection.
7. Bearings: Permanently sealed, lifetime, prelubricated, ball bearings.
8. Disconnect: Internal power cord with plug and receptacle.

G. Filters:

1. Disposable Panel Filters: Factory-fabricated, viscous-coated, flat-panel-type, disposable air filters with glass-fiber media sprayed with nonflammable adhesive in galvanized-steel frame.
2. Washable Panel Filters: Removable, aluminum, baffle-type filters with spring-loaded fastening; with minimum 0.0781-inch-thick, stainless steel filter frame.
3. Mounting Frames: Welded, galvanized steel with gaskets and fasteners and suitable for bolting together into built-up filter banks.

H. Controls:
1. Automatic Door Switch: Magnetic, installed in door area to activate air curtain when door opens and to deactivate air curtain when door closes.
2. Start-Stop, Push-Button Switch: Manually activates and deactivates air curtain.
3. Three-Speed Switch: Manually activates, deactivates, and controls air-curtain fan speed.
4. Motor-Control Panel: Complete with motor starter, 115-V ac transformer with primary and secondary fuses, terminal strip, and NEMA 250, Type 1 enclosure.

I. Accessories:

1. Mounting Brackets: Adjustable mounting brackets for wall mounting.
2. Discharge Extension Neck: For ceiling-recessed installation.

2.3 SOURCE QUALITY CONTROL

A. Source Quality Control: Test to 300 and 200 psig underwater.

B. AMCA Certification for Fan Aerodynamic Performance Rating: Test, rate, and label, air curtain units in accordance with AMCA 211.

C. AMCA Certification for Fan Sound Performance Rating: Test, rate, and label, air curtain units in accordance with AMCA 311.

D. Comply with AHRI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils," for components, construction, and rating.

E. Comply with NSF 37, "Air Curtains for Entranceways in Food and Food Service Establishments."

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install air curtains with clearance for equipment service and maintenance.

B. Equipment Installation: Install air curtains. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

C. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

3.2 PIPING CONNECTIONS

A. Comply with requirements for heating hot-water piping specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.5 ADJUSTING

A. Adjust motor speed to achieve specified airflow.

B. Adjust discharge louver and dampers to regulate airflow.

C. Adjust air-directional vanes.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections:

1. After installing air curtains completely, perform visual and mechanical check of individual components.
2. After electrical circuitry has been energized, start unit to confirm motor rotation and unit operation. Certify compliance with test parameters.
3. Inspect for water leaks.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Air-curtain unit will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train [**Train**] Owner's maintenance personnel to adjust, operate, and maintain commercial air curtains.

END OF SECTION 233433

SECTION 23 3533

KITCHEN VENTILATION SYSTEM EXHAUST DUCTS

PART 1- GENERAL

SCHEDULE 0 - SUMMARY
PRODUCT DATA SHEET 0 - Section Includes:
1.1 Ductwork for removal of grease and smoke laden vapors.

SCHEDULE 1 - REFERENCES
PRODUCT DATA SHEET 0 - Underwriters Laboratories (UL) and American Society for Testing and Materials (ASTM) per SBCCI acceptance criteria:
1.1 UL1978 Test Standard - Grease Ducts for Restaurant Cooking Appliances
1.2 UL103HT: Diameters 6 inches through 14 inches
1.3 UL2221 Condition B: Diameters 6 inches through 18 inches
1.4 ASTM E814/UL1479: Diameters 6 inches through 18 inches
PRODUCT DATA SHEET 1 - National Fire Protection Association (NFPA):
1.1 NFPA 96 - Ventilation Control And Fire Protection Of Commercial Cooking Operations

SCHEDULE 2 - QUALITY ASSURANCE
PRODUCT DATA SHEET 0 - Comply with NFPA 96 unless otherwise indicated.
PRODUCT DATA SHEET 1 - Must install duct in accordance to manufacturers listings and installation instructions.

SCHEDULE 3 - WARRANTY
PRODUCT DATA SHEET 0 - Listed grease duct shall have a limited lifetime warranty to begin at the date of installation.

PART 2- PRODUCTS

2.1 AVAILABLE MANUFACTURERS
A. Listed Double-Wall Insulated grease duct shall be model IPIC 2G grease duct manufactured by Metal-Fab, Inc.

2.2 LISTED DUCTWORK FOR REMOVAL OF GREASE AND SMOKE LADEN VAPORS
A. The grease duct shall be insulated double-wall factory –built type for use with Type I kitchen hoods, as described in NFPA-96 for the transportation of air and grease-laden vapors from commercial cooking operation.
B. Product Description:
a. Metal-Fab Series 2G Grease Duct.
b. Factory prefabricated, double wall type, listed for venting of grease laden air from kitchen hoods requiring grease duct as described in NFPA 96.
c. Rated for continuous operation at 500° F and intermittent operation at 2000° F.
d. All components of the grease duct system shall be provided by the manufacturer to ensure the system meets the requirements of the listing including duct supports, guides, fittings,

cleanouts, and expansion joints required to install the duct.

e. Grease duct shall be listed by the following agencies with the associated listed reports:
   i. UL 1978 (File MH8251) - Grease Ducts for Restaurant Cooking Appliances.
   ii. UL103HT (MH8251) - Standard for factory built chimneys and building heating appliances.
   iii. UL2221 (File R 15388) – Condition B – evaluated as an alternative to a 2 hour site-built and chased installation with 3 inches minimum clearance to a fully enclosed combustible construction.
f. The duct sections shall be constructed of an inner wall and an outer wall with ceramic fiber insulation between the walls.
   i. The inner wall shall be constructed of 304, 316 or 430 stainless steel.
      1. 6 through 36 inch diameter materials: 0.035 inch thick inner wall.
      2. 38 through 48 inch diameter materials: 0.048 inch thick inner wall.
   ii. The outer wall shall be constructed of aluminized steel, 304 or 316 stainless steel.
      1. 6 thru 22 diameter inch materials: 0.024 inch thick outer wall.
      2. 24 thru 48 inch diameter materials: 0.034 thick outer wall.
   iii. The duct shall include a 2" thickness of body soluble ceramic fiber insulation between the inner and outer walls.
g. The duct wall assembly is Tested and Listed to 1 inch clearance to combustibles for 6 inch to 18 inch diameters, 2 inches clearance to combustibles for 20 to 32 inch diameters, 3 inches clearance to combustibles for 34 to 42 inch diameters, 4 inches clearance to combustibles for 44 to 48 inch diameters.

PART 3-EXECUTION

3.1 CONSTRUCTION OF FACTORY BUILT GREASE DUCT

A. Inner pipe joints shall be held together by means of formed vee bands and sealed with P080 Grease Duct Sealant.
B. Connection to the hood will be made with a round hood collar or a square-to-round transition.
C. Curb mounted fans will incorporate a fan adaptor plate
D. All construction and supporting of the kitchen ventilation system will be in accordance with Metal-Fab, Inc. installation instructions.
E. Store grease duct sections inside or covered adequately to protect from weather or accidental damage.

END OF SECTION

SECTION 233600

AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Series fan-powered air terminal units.
   2. Casing liner.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of air terminal unit.

B. Shop Drawings: For air terminal units.

   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. Include diagrams for power, signal, and control wiring.
   4. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and other details, or BIM model, drawn to scale, indicating the items described in this Section, and coordinated with all building trades.

B. Seismic Qualification Data: For air terminal units, accessories, and components, from manufacturer.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a Qualified Electrical Testing Laboratory, and marked for intended location and application.

B. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

2.2 SERIES FAN-POWERED AIR TERMINAL UNITS

A. Furnish and install a product by one of the following manufacturers:
1. Titus.
2. Price Industries..

B. Description: Volume-damper assembly and centrifugal fan in series arrangement inside unit casing with control components inside a protective metal shroud.

1. Designed for quiet operation.
2. Low-profile design.

C. Casing: Minimum 20-gauge thick galvanized steel.

1. Casing Liner: Comply with requirements in "Casing Liner" Article below for "Casing Liner, Fibrous Glass" Paragraph.
2. Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket and quarter-turn latches.
5. Fan: Forward-curved centrifugal.

D. Volume Damper: Galvanized steel with flow-sensing ring and peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 1.0” inlet static pressure.

E. Velocity Sensors: Multipoint array with velocity sensors in air inlet.

F. Fan Motor:

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Type: Electronically commutated motor.
3. Fan-Motor Assembly Isolation: Rubber isolators.

4. Efficiency: Premium efficient as defined by NEMA MG-1.
5. Motor Speed: Variable speed.

    a. Speed Control: Infinitely adjustable with pneumatic-electric and electronic controls.

G. Filters:

1. Polyurethane Foam: MERV 3. Minimum efficiency reporting value and average arrestance in accordance with ASHRAE 52.2.
2. Pleated Glass Fiber: Factory-fabricated, self-supported disposable air filter with holding frames. Provide MERV 6 filters with minimum efficiency reporting value is to be in accordance with ASHRAE 522.

H. Attenuator Section: Casing material and thickness matching associated air terminal unit casing. Provide absorptive attenuator integral with the plenum inlet of the air terminal unit, of noise transmission loss performance as required in schedules on Drawings.

I. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch. Include manual air vent and drain valve. Locate coil in discharge outlet airstream. Provide hydronic heating coils for air terminal units scheduled on Drawings.

J. Factory-Mounted and -Wired Controls: Electrical components mounted in control box with removable cover. Incorporate single-point electrical connection to power source.

1. Control Transformer: Factory mounted for control voltage on electric and electronic control units with terminal strip in control box for field wiring of thermostat and power source.
2. Wiring Terminations: Fan and controls to terminal strip. Terminal lugs to match quantities, sizes, and materials of branch-circuit conductors. Enclose terminal lugs in terminal box that is sized in accordance with NFPA 70.
3. Disconnect Switch: Factory-mounted fuse type.

K. Control Panel Enclosure: NEMA 250, Type 1, with access panel sealed from airflow and mounted on side of unit.

L. Electric Controls:

1. Electric Damper Actuator: 24 V, spring-return open.
2. Electric Thermostat: Wall-mounted electronic type with clock display, temperature display in Fahrenheit and Celsius.

3. Air Volume Controls: Pressure-dependent volume controls with field-adjustable minimum and maximum position stops.

M. Electronic Controls:

1. Electronic Damper Actuator: 24 V, spring-return open.
2. Electronic Thermostat: Wall-mounted electronic type with temperature display in Fahrenheit and Celsius.
3. Electronic Air Volume Controller: Pressure-independent analog electronic controller, factory calibrated and field adjustable to minimum and maximum air volumes; provides consistent airflow to the space in response to electronic thermostat signal while compensating for inlet static-pressure variations of up to 4 inches wg; includes a multipoint velocity sensor at air inlet.

N. Direct Digital Controls:

1. Terminal Unit Controller: Pressure-independent, VAV controller and integrated actuator, and electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes.

    a. Occupied and unoccupied operating mode.
    b. Remote reset of airflow or temperature set points.
    c. Adjusting and monitoring with portable terminal.
    d. Communication with temperature-control system specified in Section 230923 "Instrumentation and Control for HVAC."

2. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.
3. Terminal Unit Controller, Section 230923: Controller is to be factory mounted and wired by air terminal unit manufacturer; unit controller, actuators, and room sensors are to be furnished under Section 230923 "Direct Digital Control (DDC) for HVAC".

O. Control Sequence: See Section 230993.11 "Sequence of Operation for HVAC" for control sequences.

2.3 CASING LINER

A. Casing Liner, Fibrous Glass: Fibrous-glass duct liner, complying with ASTM C1071, NFPA 90A or NFPA 90B, and with NAIMA AH124.

1. Minimum Thickness: 1/2 inch.

    a. Maximum Thermal Conductivity:

        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2.4 SOURCE QUALITY CONTROL

A. AHRI 880 Certification: Test, rate, and label assembled air terminal units in accordance with AHRI 880.

B. Water Coils: Factory pressure test to 300 psig in accordance with AHRI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with Section 230529 "Hangers and Supports for HVAC Piping and Equipment" and Section 233113 "Metal Ducts" for hangers and supports.

B. Install air terminal units according to NFPA 90A.

C. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

D. Install wall-mounted thermostats.

3.2 PIPING CONNECTIONS

A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.

B. Hot-Water Piping: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties," and connect heating coils to supply piping with shutoff valve, strainer, control valve, and union or flange; and to return piping with balancing valve and union or flange.

3.3 DUCTWORK CONNECTIONS

A. Comply with requirements in Section 233113 "Metal Ducts" for connecting ducts to air terminal units.

B. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 "Air Duct Accessories."

3.4 ELECTRICAL CONNECTIONS

A. Install field power to each air terminal unit electrical power connection. Coordinate with air terminal unit manufacturer and installers.

B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

D. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

E. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.6 IDENTIFICATION

A. Label each air terminal unit with drawing designation, nominal airflow, maximum and minimum factory-set airflows, and coil type. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.

4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.8 ADJUSTING

A. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air terminal unit testing, adjusting, and balancing.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Air terminal unit will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 233600

SECTION 23 3713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Work Included: Provide diffusers, registers, and grilles in accordance with the Contract Documents.

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

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Titus.
2. Price Industries.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 23 7200

AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Packaged energy recovery ventilator (ERV)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

   1. Suspended ceiling components.
   2. Structural members to which equipment or suspension systems will be attached.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) of each type of filter specified.

1.7 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. ARI Compliance:

1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air- Cooling and Air-Heating Coils."

C. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. UL Compliance:

1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."
2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.8 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy Recovery Units: One years.
2. Warranty Period for Energy Transfer Core: 10 years.

PART 2 - PRODUCTS

2.1 PACKAGED ENERGY RECOVERY VENTILATOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
1. RenewAire LLC.
2. Lossnay Corp.
3. Oxygen 8.

B. Unit Cabinet: Fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached.

C. Blowers:
1. Direct drive centrifugal blowers running simultaneously supplying and extracting air at the same rate for balanced ventilation air flow
2. The blower motors shall be a directly connected to the blower wheels and have permanently lubricated bearings

D. Heat Exchanger:

1. The enthalpic heat exchanger element shall be constructed of specially treated cellulous fiber membrane separated by corrugated layers to allow total heat (sensible and latent) energy recovery from the exhaust air to the supply air or from the supply air to the exhaust air as determined by design conditions.
2. Heat exchanger does not require condensate drain

E. Bypass Damper:
1. Automatic supply side by-pass damper to allow inbound ventilation air to by-pass the heat exchanger element when factory-installed thermistors measure outside ambient temperature being at least 7 degrees cooler than air returned from interlocked indoor units running in cooling mode
2. The mechanism for opening and closing the bypass damper shall be a 208V-230V synchronous electric motor through an actuator. The motor will drive a steel cable connected to a mechanical damper flap to allow fresh air to bypass the element

F. Air Filters: Factory installed, washable air filters located at each intake face (both supply and exhaust sides) of the heat exchanger element

2.2 CONTROLS

A. Independent control by contact closure from other sensor driven controller.

B. Electric-Coils Controls:

1. Factory-mounted sensor in unit discharge with sensor adjustment located in control panel to control electric coil to maintain temperature.
2. Wall-mounted, space-temperature sensor with temperature adjustment to control electric coil to maintain temperature.
3. Coil Controls: Multiple steps.

2.3 CAPACITIES AND CHARACTERISTICS

A. See equipment schedules on drawings for capacities and characteristics

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 237416

PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes packaged, large-capacity, rooftop air conditioning units (RTUs) with the following components:

1. Casings.
2. Fans, drives, and motors.
3. Coils.
4. Refrigerant circuit components.
5. Air filtration.
6. Dampers.
7. Electrical power connections.
8. Controls.
9. Roof curbs.
10. Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of RTU.

B. Shop Drawings: For each packaged, large-capacity, rooftop air-conditioning units.

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. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.
2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and other details, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. Sample Warranty: For manufacturer's warranty.

C. Seismic Qualification Data: Certificates, for RTUs, accessories, and components, from manufacturer.

D. Product Certificates: Submit certification that specified equipment will withstand wind forces identified in "Performance Requirements" Article and in Section 230548 "Vibration and Seismic Controls for HVAC."

E. Source quality-control reports.

F. System startup reports.

G. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.5 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace components of outdoor, semi-custom, air-handling unit that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 Furnish and install a unit by one of the following manufacturers:

A. Trane Company.
B. Carrier Corporation.
C. Johnson Controls.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

2.3 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of RTUs and components.

C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE 15 Compliance: For refrigeration system safety.

E. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

F. UL Compliance: Comply with UL 1995.

G. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design mounting and restraints for RTUs, including comprehensive engineering analysis.

1. Design RTU supports to comply with [wind] [and] [seismic] performance requirements.

2.2 Evaporator fan compartment:

1. Interior cabinet surfaces shall be insulated with a minimum $^{1}/_{2}$-in. thick, minimum $1^{1}/_{2}$-lb density, flexible fiberglass insulation bonded with a phenolic binder, neoprene coated on the air side.

2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

3. Unit internal insulation linings shall be resistant to mold growth in accordance with “mold growth and humidity” test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the “Erosion Test” in UL 181, as part of ASTM C1071.

2.3 Instrumentation and control devices for HVAC

A. Thermostats

1. Thermostat must

a. energize both “W” and “G” when calling for heat.

b. have capability to energize 2 different stages of cooling, and 2 different stages of heating.

c. include capability for occupancy scheduling.

c.

2.4 Compressor over-temperature, over-current.

2. Low-pressure switch:

a. Units shall have different sized connectors for the circuit 1 and circuit 2 low and high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.

b. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or trouble-shoot the rooftop unit.

3. High-pressure switch.

a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 low and high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.

b. Low pressure switch shall use different color wire than the high-pressure switch. The purpose is to assist the installer and service technician to correctly wire and/or trouble-shoot the rooftop unit.

4. Automatic reset, motor thermal overload protector.

2.5 Panel air filters

A. Standard filter section

Shall consist of factory-installed, low velocity, throwaway 2-in. thick fiberglass filters of commercially available sizes.

2. Unit shall use only one filter size. Multiple sizes are not acceptable.

3. Filters shall be accessible through an access panel with “no-tool” removal as described in the unit cabinet section of this specification (23 81 19.13.G).

2.6 Self-contained air conditioners

A. General:

Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.

2. Factory assembled, single piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.

3. Unit shall use Puron® R-410A refrigerant.

4. Unit shall be installed in accordance with the manufacturer's instructions.

5. Unit must be selected and installed in compliance with local, state, and federal codes.

B. Quality Assurance:

Unit meets ASHRAE 90.1-2016 and IECC[1]-2015 minimum efficiency requirements.

2. Units are Energy Star certified where sizes are required.

3. Unit shall be rated in accordance with AHRI Standard 340/360.

4. Unit shall be designed to conform to ASHRAE 15.

5. Unit shall be ETL-tested and certified in accordance with ANSI Z21.47 Standards and ETL-listed and certified under Canadian standards as a total package for safety requirements.

6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

7. Unit internal insulation linings shall be resistant to mold growth in accordance with "mold growth and humidity" test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the "Erosion Test" in UL 181, as part of ASTM C1071.

8. Unit casing shall be capable of withstanding 500 hour salt spray exposure per ASTM B117 (scribed specimen).

9. Roof curb shall be designed to conform to NRCA Standards.

10. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.

11. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.

12. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.

13. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.

14. High-Efficiency Motors listed shall meet section 313 of the Energy Independence and Security Act of 2007 (EISA 2007).

C. Delivery, storage, and handling:

Unit shall be stored and handled per manufacturer's recommendations.

2. Lifted by crane requires either shipping top panel or spreader bars.

3. Unit shall only be stored or positioned in the upright position.

D. Project conditions:

As specified in the contract.

E. Operating characteristics:

[1]IECC is a registered trademark of the International Code Council, Inc.

3 Unit shall be capable of starting and running at 125°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 340/360 at ± 10% voltage.

2. Compressor with standard controls shall be capable of operation from 35°F (2°C), ambient outdoor temperatures. Accessory kits are necessary if mechanically cooling at ambient temperatures below 35°F (2°C).

3. Unit shall discharge supply air vertically or horizontally as shown on contract drawings.

4. Unit shall be factory configured and ordered for vertical supply and return configurations.

5. Unit shall be factory furnished for either vertical or horizontal configuration without the use of special conversion kits.

6. No field kits conversion is possible.

F. Electrical Requirements:

Main power supply voltage, phase, and frequency must match those required by the manufacturer.

G. Unit Cabinet:

Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.

2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F): 60, Hardness: H-2H Pencil hardness.

3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum $^1/_2$-in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heat compartment.

4. Unit internal insulation linings shall be resistant to mold growth in accordance with "mold growth and humidity" test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the "Erosion Test" in UL 181, as part of ASTM C1071.

5. Base of unit shall have a minimum of four locations for factory thru-the-base electrical connections. Connections shall be internal to the cabinet to protect from environmental issues.

6. Base Rail:

a. Unit shall have base rails on a minimum of 2 sides.

b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.

c. Holes shall be provided in the base rail for moving the rooftop by fork truck.

d. Base rail shall be a minimum of 16 gage thickness.

7. Condensate pan and connections:

a. Shall be a sloped condensate drain pan made of a non-corrosive material.

b. Shall comply with ASHRAE Standard 62.

c. Shall use a $^{3}/_{4}$-in. 14 NPT drain connection at the end of the drain pan. Connection shall be made per manufacturer's recommendations.

8. Top panel:

a. Shall be a multi-piece top panel linked with water tight flanges and interlocking systems.

9. Electrical Connections:

a. All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location.

b. Thru-the-base capability:

1) Thru-the-base provisions / connections are available as standard with every unit. When bottom connections are required, field furnished couplings are required.

2) No basepan penetration, other than those authorized by the manufacturer, is permitted.

10. Component access panels (standard):

a. Cabinet panels shall be easily removable for servicing.

b. Unit shall have one factory installed, tool-less, removable, filter access panel.

c. Panels covering control box and filters shall have molded composite handles while the blower access door shall have an integrated flange for easy removal.

d. Handles shall be UV modified, composite, permanently attached, and recessed into the panel.

e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.

f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

H. Coils:

4 Standard Aluminum Fin/Copper Tube Coils:

a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.

c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

2. Optional Pre-coated aluminum-fin condenser coils:

a. Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments.

b. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube.

c. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.

d. Corrosion durability of fin stock shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90.

e. Corrosion durability of fin stock shall be confirmed through testing to have no visible corrosion after 48 hour immersion in a room temperature solution of 5% salt, 1% acetic acid.

f. Fin stock coating shall pass 2000 hours of the following: one week exposure in the prohesion chamber followed by one week of accelerated ultraviolet light testing. Prohesion chamber: the solution shall contain 3.5% sodium chloride and 0.35% ammonium sulfate. The exposure cycle is one hour of salt fog application at ambient followed by one hour drying at 95°F (35°C).

3. Optional Copper-fin evaporator and condenser coils:

a. Shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets.

b. Galvanized steel tube sheets shall not be acceptable.

c. A polymer strip shall prevent coil assembly from contacting the sheet metal coil pan to minimize potential for galvanic corrosion between coil and pan.

4. Optional E-coated aluminum-fin evaporator and condenser coils:

a. Shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins.

b. Coating process shall ensure complete coil encapsulation of tubes, fins and headers.

c. Color shall be high gloss black with gloss per ASTM D523-89.

d. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges.

e. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93.

f. Impact resistance shall be up to 160 in.-lb (ASTM D2794-93).

g. Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D224-92 and ASTM D870-92).

h. Corrosion durability shall be confirmed through testing to be no less than 6000 hours salt spray per ASTM B117-90.

5. Optional E-coated aluminum-fin, aluminum tube condenser coils:

a. Shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers.

b. Coating process shall ensure complete coil encapsulation, including all exposed fin edges.

c. E-coat thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.

d. Shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross-hatch adhesion of 4B-5B per ASTM D3359-02.

e. Shall have superior impact resistance with no cracking, chipping or peeling per NSF/ANSI 51-2002 Method 10.2.

I. Refrigerant components:

Refrigerant circuit shall include the following control, safety, and maintenance features:

a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.

b. Refrigerant filter drier.

c. Service gage connections on suction and discharge lines.

d. Pressure gage access through a specially designed access port in the top panel of the unit.

2. There shall be gage line access port in the skin of the rooftop, covered by a black, removable plug:

a. The plug shall be easy to remove and replace.

b. When the plug is removed, the gage access port shall enable maintenance personnel to route their pressure gage lines.

c. This gage access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on.

d. The plug shall be made of a leak proof, UV-resistant, composite material.

3. Compressors:

a. Unit shall use one fully hermetic, scroll compressor for each independent refrigeration circuit.

b. Models shall be available with 2 compressor/2-stage cooling.

c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.

d. Compressors shall be internally protected from high discharge temperature conditions.

e. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.

f. Compressor shall be factory mounted on rubber grommets.

g. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.

h. Crankcase heaters shall be utilized on all models to protect compressor with specific refrigerant charge.

J. Filter section:

Filters access is specified in the unit cabinet section of this specification.

2. Filters shall be held in place by a preformed slide out filter tray, facilitating easy removal and installation.

3. Shall consist of factory-installed, low velocity, throw-away 2-in. thick fiberglass filters.

4. Filters shall be standard, commercially available sizes.

5. Only one size filter per unit is allowed.

6. 4-in. filter capability is possible with a field-installed pre-engineered slide out filter track accessory. 4-in. filters are field furnished.

K. Evaporator fan and motor:

Evaporator fan motor:

a. Shall have permanently lubricated bearings.

b. Shall have inherent automatic-reset thermal overload protection or circuit breaker.

c. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required.

2. Belt-driven evaporator fan:

a. Belt drive shall include an adjustable-pitch motor pulley and belt break protection system.

b. Shall use rigid pillow block bearing system with lubricate fittings at are accessible or lubrication line.

c. Blower fan shall be double-inlet type with forward-curved blades.

d. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

e. Standard on all 17-28 size models with Humidi-MiZer system.

L. Condenser Fans and Motors:

Condenser fan motors:

a. Shall be a totally enclosed motor.

b. Shall use permanently lubricated bearings.

c. Shall have inherent thermal overload protection with an automatic reset feature.

d. Shall use a shaft down design on all sizes.

2. Condenser fans:

a. Shall be a direct driven propeller type fan.

b. Shall have aluminum blades riveted to corrosion resistant steel spiders and shall be dynamically balanced.

M. (23 81 19.13.M.) Special features, options, and accessories:

Integrated Economizer (Factory-installed on 3-phase models only. Field installed on all 3 and 1-phase models):

a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.

b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory-installed option.

c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.

d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.

e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.

f. Low leak rate models shall be equipped with dampers not to exceed 2% leakage at 1 in. wg pressure differential.

k. Shall be capable of introducing up to 100% outdoor air.

l. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1-2016 and IECC-2015 requirements.

m. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.

n. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory-installed only. Outdoor air sensor setpoint shall be adjustable and shall range from 40°F to 100°F (4°C to 38°C). Additional sensor options shall be available as accessories.

o. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.

p. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.

q. Dampers shall be completely closed when the unit is in the unoccupied mode.

r. Economizer controller shall accept a 2 to 10 Vdc CO_2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.

s. Compressor lockout temperature on W7220 is adjustable from –45°F to 80°F, set at a factory default of 32°F. Others shall open at 35°F (2°C) and close at 50°F (10°C).

t. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.

u. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.

5. Integrated EconoMi$er2, and EconoMi$er X Ultra Low Leak rate models. (Factory-installed on 3 phase models only. Field-installed on all 3 and 1 phase models):

a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.

b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory-installed option.

c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.

d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.

e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.

f. Ultra Low Leak design meets California Title 24 section 140.4 and, ASHRAE 90.1-2016 and IECC-2015 requirements for 4 cfm per sq. ft. on the outside air dampers and 10 cfm per sq. ft. on the return dampers.

13. HACR Breaker:

a. These manual reset devices provide overload and short circuit protection for the unit. Factory wired and mounted with the units, with access cover to help provide environmental protection. On 575V applications, HACR breaker can only be used with WYE power distribution systems. Use on Delta power distribution systems is prohibited.

b. Sized only for the unit as ordered from the factory. Does not accommodate field-installed devices.

14. Convenience outlet:

a. Powered convenience outlet. (Not available on single phase models):

1) Outlet shall be powered from main line power to the rooftop unit.

2) Outlet shall be powered from line side or load side of disconnect by installing contractor, as required by code. If outlet is powered from load side of disconnect, unit electrical ratings shall be UL certified and rated for additional outlet amperage.

3) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.

4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.

5) Voltage required to operate convenience outlet shall be provided by a factory-installed step down transformer.

6) Outlet shall be accessible from outside the unit.

7) Outlet shall include a field-installed “Wet in Use” cover.

b. Factory-installed non-powered convenience outlet:

1) Outlet shall be powered from a separate 115-120v power source.
2) A transformer shall not be included.
3) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
4) Outlet shall include 15 amp GFI receptacles.
5) Outlet shall be accessible from outside the unit.
6) Outlet shall include a field-installed “Wet in Use” cover.

c. Field-installed non-powered convenience outlet:

1) Outlet shall be powered from a separate 115-120v power source.
2) A transformer shall not be included.
3) Outlet shall be field-installed and internally mounted with easily accessible 115-v female receptacle.
4) Outlet shall include 20 amp GFI receptacles. This kit provides a flexible installation method which allows code compliance for height requirements of the GFCI outlet from the finished roof surface as well as the capability to relocate the outlet to a more convenient location.
5) Outlet shall be accessible from outside the unit.
6) Outlet shall include a field-installed “Wet in Use” cover.

15. Fan/Filter Status Switch:

a. Switch shall provide status of indoor evaporator fan (ON/OFF) or filter (CLEAN/DIRTY).

b. Status shall be displayed either over communication bus (when used with direct digital controls) or with an indicator light at the thermostat.

16. Thru-the-base connectors:

a. Kits shall provide connectors to permit electrical connections to be brought to the unit through the unit basepan.

b. Minimum of three connection locations per unit.

17. Propeller power exhaust:

a. Power exhaust shall be used in conjunction with an integrated economizer.

b. Independent modules for vertical or horizontal return configurations shall be available.

c. Horizontal power exhaust shall be mounted in return ductwork.

d. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0-100% adjustable setpoint on the economizer control.

18. Roof curbs (vertical):

a. Full perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.

b. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.

c. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.

20. Outdoor air enthalpy sensor:

a. The outdoor air enthalpy sensor shall be used to provide single enthalpy control. When used in conjunction with a return air enthalpy sensor, the unit will provide differential enthalpy control. The sensor allows the unit to determine if outside air is suitable for free cooling.

21. Return air enthalpy sensor:

a. The return air enthalpy sensor shall be used in conjunction with an outdoor air enthalpy sensor to provide differential enthalpy control.

22. Indoor air quality (CO_2) sensor:

a. Shall be able to provide demand ventilation indoor air quality (IAQ) control.

b. The IAQ sensor shall be available in duct mount, wall mount, or wall mount with LED display. The setpoint shall have adjustment capability.

23. CO_2 sensor (EnergyX):

a. The modulating airflow energy recovery unit shall be capable of incorporating a CO_2 sensor for use with Demand Controlled Ventilation.

b. The CO_2 sensor shall connect to the base rooftop unit's digital controller.

c. The modulating airflow energy recovery unit shall use at a minimum, a high and low CFM airflow set point when a CO_2 sensor is used.

24. Smoke detectors:

a. Shall be a four-wire controller and detector.

b. Shall be environmental compensated with differential sensing for reliable, stable, and drift-free sensitivity.

c. Shall use magnet-activated test/reset sensor switches.

d. Shall have tool-less connection terminal access.

e. Shall have a recessed momentary switch for testing and resetting the detector.

f. Controller shall include:

1) One set of normally open alarm initiation contacts for connection to an initiating device circuit on a fire alarm control panel.

2) Two Form-C auxiliary alarm relays for interface with rooftop unit or other equipment.

3) One Form-C supervision (trouble) relay to control the operation of the Trouble LED on a remote test/reset station.

4) Capable of direct connection to two individual detector modules.

5) Can be wired to up to 14 other duct smoke detectors for multiple fan shut-down applications.

25. Horn/Strobe Annunciator:

a. Provides an audible/visual signaling device for use with factory-installed option or field-installed accessory smoke detectors.

1) Requires installation of a field-supplied 24-v transformer suitable for 4.2 VA (AC) or 3.0 VA (DC) per horn/strobe accessory.

2) Requires field-supplied electrical box, North American 1-gang box, 2-in. (51 mm) x 4-in. (102 mm).

3) Shall have a clear colored lens.

26. Winter start kit:

a. Shall contain a bypass device around the low pressure switch.

b. Shall be required when mechanical cooling is required down to 25°F (–4°C).

c. Shall not be required to operate on an economizer when below an outdoor ambient of 40°F (4°C).

27. Time guard:

a. Shall prevent compressor short cycling by providing a 5 minute delay (±2 minutes) before restarting a compressor after shutdown for any reason.

b. One device shall be required per compressor.

28. Condensate Overflow Switch:

a. This sensor and related controller monitors the condensate level in the drain pan and shuts down compression operation when overflow conditions occur. It includes:

1) Indicator light - solid red (more than 10 seconds on water contact - compressors disabled), blinking red (sensor disconnected).

2) 10 second delay to break - eliminates nuisance trips from splashing or waves in pan (sensor needs 10 seconds of constant water contact before tripping).

3) Disables the compressor(s) operation when condensate plug is detected, but still allows fans to run for Economizer.

31. Hinged Access panels:

a. Shall provide easy access through integrated quarter turn latches.

b. Shall be on major panels of filter, control box, fan motor and compressor.

32. Display kit for variable frequency drive:

a. Kit allows the ability to access the VFD controller programs to provide special setup capabilities and diagnostics.

b. Kit contains display module and communication cable.

c. Display Kit can be permanently installed in the unit or used on any SAV system VFD controller as needed.

33. California OSHPD Seismic Certification Label:

a. Units meet the seismic capacity requirements of the International Code Council Evaluation Service (ICC-ES) document AC156 (Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems) and per International Building Code (IBC 2009) at an SDS (g) value of 2.00 z/h=1.0, Ip=1.5 and certified by independent structural engineers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

B. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

3.2 PIPING CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to RTU, allow space for service and maintenance.

C. Connect piping to unit mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using copper tubing. Extend to nearest equipment or roof drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Steam Piping: Comply with applicable requirements in Section 232216. Install shutoff valve and union or flange at each coil supply connection.

3.3 DUCT CONNECTIONS

A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.4 ELECTRICAL CONNECTIONS

A. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2 inch high.
3. Locate nameplate where easily visible.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."
1.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. RTU will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 237416

SECTION 238129

VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes complete VRF HVAC system(s) including, but not limited to the following components to make a complete operating system(s) according to requirements indicated:

1. Indoor, concealed, ceiling-mounted units for ducting.
2. Indoor, concealed, floor-mounted units for ducting.
3. Indoor, exposed, wall-mounted units.
4. Indoor, recessed, ceiling-mounted units.
5. Indoor, suspended, ceiling-mounted units.
6. Outdoor, air-source, heat pump units.
7. Outdoor, air-source heat recovery units.
8. Heat recovery control units.
9. System controls.
10. System refrigerant and oil.
11. System condensate drain piping.
12. System hydronic piping.
13. System refrigerant piping.
14. Metal hangers and supports.
15. Metal framing systems.
16. Fastener systems.
17. Pipe stands.
18. Equipment stands.
19. Miscellaneous support materials.
20. Piping and tubing insulation.
21. System control cable and raceways.

1.2 DEFINITIONS

A. Air-Conditioning System Operation: System capable of operation with all zones in cooling only.

B. Heat-Pump System Operation: System capable of operation with all zones in either heating or cooling, but not with simultaneous heating and cooling zones that transfer heat between zones.

C. Heat Recovery System Operation: System capable of operation with simultaneous heating and cooling zones that transfer heat between zones.

D. HRCU: Heat Recovery Control Unit. HRCUs are used in heat recovery VRF HVAC systems to manage and control refrigerant between indoor units to provide simultaneous heating and cooling zones. "Heat Recovery Control Unit" is the term used by ASHRAE for what different manufacturers term as branch circuit controller, branch selector box, changeover box, flow selector unit, mode change unit, and other such terms.

E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

F. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

G. Three-Pipe System Design: One high pressure refrigerant vapor line, one low pressure refrigerant vapor line, and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One liquid line and refrigerant vapor line connect HRCUs to associated indoor units.

H. Two-Pipe System Design: One refrigerant vapor line and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One refrigerant liquid line and refrigerant vapor line connect HRCUs to associated indoor units. HRCUs used in two pipe systems act as an intermediate heat exchanger and include diverting valves and gas/liquid separators to move high and low pressure refrigerant between indoor units.

I. VRF: Variable refrigerant flow.

1.3 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings: For VRF HVAC systems.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Include diagrams and details of refrigerant piping and tubing showing installation requirements for manufacturer-furnished divided flow fittings.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For fully and partially exposed indoor units with factory finishes viewable by occupants.

D. Delegated-Design Submittals:

1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.
2. Include design calculations with corresponding diagram of refrigerant piping and tubing sizing for each system installed.
3. Include design calculations with corresponding floor plans indicating that refrigerant concentration limits are within allowable limits of ASHRAE 15 and governing codes.
4. Include calculations showing that system travel distance for refrigerant piping and controls cabling are within horizontal and vertical travel distances set by manufacturer. Provide a comparison table for each system installed.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, sections, and details, drawn to scale, using input from installers of the items involved.

B. Qualification Data:

1. For Installer.
2. For VRF HVAC system manufacturer.
3. For VRF HVAC system provider.

C. Seismic Qualification Data: Certificates, for equipment, accessories, and components, from manufacturer.

D. Product Certificates: For each type of product.

E. Product test reports.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On CD or DVD, USB media, or approved cloud storage platform, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 QUALITY ASSURANCE

A. Factory-Authorized Service Representative Qualifications:

1. Authorized representative of, and trained by, VRF HVAC system manufacturer.
2. In-place facility located within reasonable distance of Project.
3. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
4. Demonstrated past experience on five projects of similar complexity, scope, and value.

    a. Each person assigned to Project shall have demonstrated past experience.

5. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
6. Service and maintenance staff assigned to support Project during warranty period.
7. Product parts inventory to support ongoing system operation for a period of not less than five years after Substantial Completion.
8. VRF HVAC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by VRF HVAC system manufacturer.

1. Each employee shall be certified by manufacturer for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certification shall be valid and current for duration of Project.
3. Retain copies of Installer certificates on-site and make available on request.
4. Each person assigned to Project shall have demonstrated past experience.

    a. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
    b. Demonstrated past experience on five projects of similar complexity, scope, and value.

C. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period:

    a. For Compressor: 10 years from date of Substantial Completion.
    b. For Parts, Including Controls: Seven years from date of Substantial Completion.

c. For Labor: Five > years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Daikin Applied.
2. Trane-Mistubishi
3. Carrier Corp.

2.2 SYSTEM DESCRIPTION

A. Direct-expansion (DX) VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, [HRCUs,]outdoor unit(s), piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.

1. [Two-pipe] or three-pipe system design.
2. System(s) operation: heat recovery as indicated on Drawings.
3. Each system with one refrigerant circuit shared by all indoor units connected to system.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. AHRI Compliance: System and equipment performance certified according to AHRI 1230[and products listed in AHRI directory].

D. ASHRAE Compliance:

1. ASHRAE 15: For safety code for mechanical refrigeration.
2. ASHRAE 62.1: For indoor air quality.
3. ASHRAE 135: For control network protocol with remote communication.
4. ASHRAE/IES 90.1 Compliance: For system and component energy efficiency.

E. UL Compliance: Comply with UL 1995.

2.3 PERFORMANCE REQUIREMENTS

1. Provide system refrigerant calculations.

a. Refrigerant concentration limits shall be within allowable limits of ASHRAE 15 and governing codes.
b. Indicate compliance with manufacturer's maximum vertical and horizontal travel distances. Prepare a comparison table for each system showing calculated distances compared to manufacturer's maximum allowed distances.

2. Include a mechanical ventilation system and gas detection system as required to comply with ASHRAE 15 and governing codes.
3. System Refrigerant Piping and Tubing:

a. Arrangement: Arrange piping to interconnect indoor units[, HRCUs,] and outdoor unit(s) in compliance with manufacturer requirements and requirements indicated.
b. Routing: Conceal piping above ceilings and behind walls to maximum extent possible.
c. Sizing: Size piping system, using a software program acceptable to manufacturer, to provide performance requirements indicated. Consider requirements to accommodate future change requirements.

4. System Controls:

a. Network arrangement.
b. Network interface with other building systems.
c. Product selection.
d. Sizing.

B. Service Access:

1. Provide and document service access requirements.
2. Locate equipment, system isolation valves, and other system components that require service and inspection in easily accessible locations. Avoid locations that are difficult to access if possible.
3. Where serviceable components are installed behind walls and above inaccessible ceilings, provide finished assembly with access doors or panels to gain access. Properly size the openings to allow for service, removal, and replacement.
4. If less than full and unrestricted access is provided, locate components within an 18-inch reach of the finished assembly.
5. Where ladder access is required to service elevated components, provide an installation that provides for sufficient access within ladder manufacturer's written instructions for use.
6. Comply with OSHA regulations.

C. System Design and Installation Requirements:

1. Design and install systems indicated according to manufacturer's recommendations and written instructions.
2. Where manufacturer's requirements differ from requirements indicated, contact Architect for direction. The most stringent requirements should apply unless otherwise directed in writing by Architect.

D. System Adaptability to Future Changes: Arrange and size system refrigerant piping to accommodate future changes to system without having to resize and replace existing refrigerant piping.

1. Future changes to system(s) indicated on Drawings.
2. Each branch circuit shall accommodate addition of one indoor unit minimum with unit capacity equal to average capacity requirement indoor unit connected to the branch circuit.
3. Each branch circuit shall accommodate deletion of one indoor unit minimum with unit capacity equal to average capacity requirement indoor unit connected to the branch circuit.
4. Owner approval required for future changes.

E. Isolation of Equipment: Provide isolation valves to isolate each indoor unit and outdoor unit for service, removal, and replacement without interrupting system operation.

F. System Capacity Ratio: The sum of connected capacity of all indoor units shall be within the following range of outdoor-unit rated capacity:

1. Not less than 50 percent.
2. Not more than 130 percent.
3. Range acceptable to manufacturer.

G. System Turndown: Stable operation down to 10 percent of outdoor-unit capacity.

H. System Auto Refrigerant Charge: Each system shall have an automatic refrigerant charge function to ensure the proper amount of refrigerant is installed in system.

I. Outdoor Conditions:

1. Suitable for outdoor ambient conditions encountered.
    a. Design equipment and supports to withstand snow and ice loads of governing code.
    b. Provide corrosion-resistant coating for components and supports where located in coastal or industrial climates that are known to be harmful to materials and finishes.

2. Maximum System Operating Outdoor Temperature: See Drawings .
3. Minimum System Operating Outdoor Temperature: See Drawings .

J. Sound Performance: Sound levels generated by operating HVAC equipment shall be within requirements indicated.

1. Indoor: See Drawings.
2. Outdoor: See Drawings .

K. Thermal Movements: Allow for controlled thermal movements from ambient, surface, and system temperature changes.

L. Capacities and Characteristics: As indicated on Drawings.

2.4 INDOOR, CONCEALED, CEILING-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Galvanized steel.
2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Mounting: Manufacturer-designed provisions for field installation.
5. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

a. Direct-drive arrangement.
b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.

d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, side, or rear to accommodate field installation without removing ductwork and to accommodate filter replacement without need for tools.
2. Efficiency: ASHRAE 52.2, MERV 7 .
3. Media:[If more than one filter type is indicated, Contractor has option to choose.]

a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Unit Accessories:

1. Outdoor Air Ventilation Kit: Connection, motorized damper, and control sized to allow sequence of operation indicated on Drawings.
2. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
3. .

H. Unit Controls:

1. Enclosure: Metal, suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

a. Unit inlet air temperature.
b. Coil entering refrigerant temperature.
c. Coil leaving refrigerant temperature.
d. Sensor.

4. Features and Functions:

a. Self-diagnostics.
b. Time delay.
c. Auto-restart.
d. External static pressure control.
e. Auto operation mode.
f. Manual operation mode.
g. Filter service notification.
h. Power consumption display.
i. Drain assembly high water level safety shutdown and notification.

j. Run test switch.

5. Communication: Network communication with other indoor and outdoor units.
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

I. Unit Electrical:

1. Enclosure: Metal, suitable for indoor locations.
2. Field Connection: Single point connection to power unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in raceways.

2.5 INDOOR, CONCEALED, FLOOR-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled[and -tested] complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Galvanized steel.
2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Mounting: Manufacturer-designed provisions for field installation.
5. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Materials: Non-ferrous components or ferrous components with corrosion resistant finish.
    d. Statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, side, or rear to accommodate field installation without removing ductwork and to accommodate filter replacement without need for tools.
2. Efficiency: ASHRAE 52.2, MERV 7

    a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
    b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Unit Accessories:

1. Outdoor Air Ventilation Kit: Connection, motorized damper, and control sized to allow sequence of operation indicated on Drawings.
2. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

H. Unit Controls:

1. Enclosure: Metal, suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

    a. Unit inlet air temperature.
    b. Coil entering refrigerant temperature.

c. Coil leaving refrigerant temperature.
d. Sensor.

4. Features and Functions:

a. Self-diagnostics.
b. Time delay, auto-restart.
c. External static pressure control.
d. Auto operation mode.
e. Manual operation mode.
f. Filter service notification.
g. Power consumption display.
h. Drain assembly high water level safety shutdown and notification.
i. Run test switch.

5. Communication: Network communication with other indoor units and outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

I. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for indoor locations.
2. Field Connection: Single point connection to power unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways.

2.6 INDOOR, EXPOSED, FLOOR-MOUNTED UNITS

A. Description: Factory-assembled complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.

    a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.

3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Materials: Non-ferrous components or ferrous components with corrosion-resistant finish.
    d. Statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.
2. Efficiency: Code Compliant
3. Washable Media: Manufacturer's standard filter with antimicrobial treatment.

G. Grille Assembly: Manufacturer's standard discharge grille with field-adjustable air pattern mounted in top of unit cabinet.

H. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

I. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

    a. Unit inlet air temperature.
    b. Coil entering refrigerant temperature.
    c. Coil leaving refrigerant temperature.
    d. Sensor.

4. Features and Functions:

    a. Self-diagnostics.
    b. Time delay.
    c. Auto-restart.
    d. External static pressure control.
    e. Auto operation mode.
    f. Manual operation mode.
    g. Filter service notification
    h. Power consumption display.
    i. Drain assembly high water level safety shutdown and notification.
    j. Run test switch.

5. Communication: Network communication with other indoor units and outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

J. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in raceways.

2.7 INDOOR, EXPOSED, WALL-MOUNTED UNITS

A. Description: Factory-assembled complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.

    a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.

3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.
2. Efficiency: Code Compliant
3. Washable Media: Manufacturer's standard filter with antimicrobial treatment.

G. Grille Assembly: Manufacturer's standard discharge grille with field-adjustable air pattern mounted in top [or front face]of unit cabinet.

H. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

I. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: [Unit inlet air temperature] [Coil entering refrigerant temperature] [Coil leaving refrigerant temperature] .
4. Features and Functions: Self-diagnostics, time delay, auto-restart.
5. Communication: Network communication with other indoor units and outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

J. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in raceways to comply with NFPA 70.

2.8 INDOOR, RECESSED, CEILING-MOUNTED UNITS

A. Description: Factory-assembled complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Efficiency: ASHRAE 52.2, MERV 7

    a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
    b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in bottom of unit cabinet.

1. Discharge Pattern: One-, two-, three-, or four-way throw as indicated on Drawings.

    a. Discharge Pattern Adjustment: Field-adjustable limits for up and down range of motion.
    b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
3. Additional Branch Supply Duct Connection: Sheet metal knockout for optional connection to one additional supply branch duct.

H. Return-Air Grille Assembly: Manufacturer's standard grille mounted in bottom of unit cabinet.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Unit Accessories:

1. Outdoor Air Ventilation Kit: Connection, motorized damper, and control to satisfy unit control sequence of operation indicated on Drawings.
2. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

K. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: Unit inlet air temperature Coil entering refrigerant temperature Coil leaving refrigerant temperature .
4. Communication: Network communication with other indoor units and outdoor unit(s).
5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

L. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in raceways to comply with NFPA 70.

2.9 INDOOR, SUSPENDED, CEILING-MOUNTED UNITS

A. Description: Factory-assembled[and -tested] complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.

a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.

3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

a. Direct-drive arrangement.
b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.
2. Efficiency: Code Compliant.
3. Washable Media: Manufacturer's standard filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in front of unit cabinet.

1. Discharge Pattern: One-way throw.
2. Discharge Pattern Adjustment: Field-adjustable limits for range of pattern.
3. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Return-Air Grille Assembly: Manufacturer's standard.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

K. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: Unit inlet air temperature
4. Communication: Network communication with other indoor units and outdoor unit(s).
5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

L. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

2.10 OUTDOOR, AIR-SOURCE HEAT-PUMP UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with either all heating or all cooling demands, but not for use in systems with simultaneous heating and cooling.
2. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.
3. All units installed shall be from the same product development generation.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

    a. Coating with documented salt spray test performance of 1000 hours according ASTM B117 surface scratch test (SST) procedure.

2. Mounting: Manufacturer-designed provisions for field installation.
3. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive and turndown to 15 percent of rated capacity.

2. Protection: Integral protection against the following:

    a. High refrigerant pressure.
    b. Low oil level.
    c. High oil temperature.
    d. Thermal and overload.
    e. Voltage fluctuations.
    f. Phase failure and phase reversal.
    g. Short cycling.

3. Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.
4. Vibration Control: Integral isolation to dampen vibration transmission.
5. Oil management system to ensure safe and proper lubrication over entire operating range.
6. Crankcase heaters with integral control to maintain safe operating temperature.
7. Fusible plug.

D. Condenser Coil Assembly:

1. Plate Fin Coils:

    a. Casing: Aluminum, galvanized, or stainless steel.
    b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
    c. Tubes: Copper, of diameter and thickness required by performance.

2. Aluminum Microchannel Coils:

    a. Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.
    b. Single- or multiple-pass arrangement.
    c. Construct fins, tubes, and header manifolds of aluminum alloy.

3. Coating: [None] [Corrosion resistant].
4. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.

E. Condenser Fan and Motor Assembly:

1. Fan(s): Propeller type.

    a. Direct-drive arrangement.
    b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.
    c. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for condenser coil.

3. Motor(s): Brushless dc or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
5. Speed Settings and Control: Variable speed with a speed range of least [75] percent.
6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

G. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

    a. Refrigerant suction temperature.
    b. Refrigerant discharge temperature.
    c. Outdoor air temperature.
    d. Refrigerant high pressure.
    e. Refrigerant low pressure.
    f. Oil level.
4. Communication: Network communication with indoor units and other outdoor unit(s).
5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

H. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in raceways to comply with NFPA 70.

I. Unit Hardware: Zinc-plated steel, or stainless steel. Coat exposed surfaces with additional corrosion-resistant coating if required to prevention corrosion when exposed to salt spray test for 1000 hours according ASTM B117.

J. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.

4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

2.11 OUTDOOR, AIR-SOURCE HEAT RECOVERY UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.
3. All units installed shall be from the same product development generation.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

    a. Coating with documented salt spray test performance of 1000 hours according ASTM B117 surface scratch test (SST) procedure.

2. Mounting: Manufacturer-designed provisions for field installation.
3. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive and turndown to 15 percent of rated capacity.
2. Protection: Integral protection against the following:

    a. High refrigerant pressure.
    b. Low oil level.
    c. High oil temperature.
    d. Thermal and overload.
    e. Voltage fluctuations.
    f. Phase failure and phase reversal.
    g. Short cycling.

3. Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.
4. Vibration Control: Integral isolation to dampen vibration transmission.
5. Oil management system to ensure safe and proper lubrication over entire operating range.
6. Crankcase heaters with integral control to maintain safe operating temperature.
7. Fusible plug.

D. Condenser Coil Assembly:

1. Plate Fin Coils:

    a. Casing: Aluminum, galvanized, or stainless steel.
    b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
    c. Tubes: Copper, of diameter and thickness required by performance.

2. Aluminum Microchannel Coils:

    a. Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.
    b. Single- or multiple-pass arrangement.
    c. Construct fins, tubes, and header manifolds of aluminum alloy.

3. Coating: None.

E. Condenser Fan and Motor Assembly:

1. Fan(s): Propeller type.

    a. Direct-drive arrangement.
    b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.
    c. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for condenser coil.
3. Motor(s): Brushless dc or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
5. Speed Settings and Control: Variable speed with a speed range of least [75] > percent.
6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

G. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

    a. Refrigerant suction temperature.
    b. Refrigerant discharge temperature.
    c. Outdoor air temperature.
    d. Refrigerant high pressure.
    e. Refrigerant low pressure.
    f. Oil level.

4. Features and Functions: Self-diagnostics, time delay, auto-restart, fuse protection, auto operation mode .
5. Communication: Network communication with indoor units and other outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

H. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in raceways to comply with NFPA 70.

I. Unit Hardware: Zinc-plated steel, or stainless steel. Coat exposed surfaces with additional corrosion-resistant coating if required to prevention corrosion when exposed to salt spray test for [1000] hours according ASTM B117.

J. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.
4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

2.12 HEAT RECOVERY CONTROL UNITS (HRCUs)

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall consist of one unit, or multiple unit that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.

B. Cabinet:

1. Galvanized-steel construction.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.

3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

D. Refrigeration Assemblies and Specialties:

1. Specially designed by manufacturer for type of VRF HVAC system being installed, either two or three pipe.
2. Each refrigerant branch circuit shall have refrigerant control valve(s) to control refrigerant flow.
3. Spares: Each heat recovery control unit shall include at least one branch circuit port(s) for future use.
4. Each system piping connection upstream of heat recovery unit shall be fitted with an isolation valve to allow for service to any heat recovery control unit in the system without interrupting operation of the system.
5. Each branch circuit connection shall be fitted with an isolation valve and capped service port to allow for service to any individual branch circuit without interrupting operation of the system.

    a. If not available as an integral part of the heat recovery control unit, isolation valves shall be field installed adjacent to the unit pipe connection.

E. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:
4. "Features and Functions" Subparagraph below indicates requirements that may not be available on some products from some manufacturers. Consult manufacturers for availability.
5. Features and Functions: Self-diagnostics, fuse protection.
6. Communication: Network communication with indoor units and outdoor unit(s).
7. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
8. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

F. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.

5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways to comply with NFPA 70.

G. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.
4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

2.13 SYSTEM CONTROLS

A. General Requirements:

1. Network: Indoor units, HRCUs, and outdoor units shall include integral controls and connect through a manufacturer-selected control network.
2. Network Communication Protocol: open control communication between interconnected units.
3. Integration with Building Automation System: ASHRAE 135, BACnet IP and certified by BACnet Testing Lab (BTL), including the following:

    a. Ethernet connection via RJ-45 connectors and port with transmission at [100] Mbps or higher.
    b. Integration devices shall be connected to local uninterruptible power supply unit(s) to provide at least [5 minutes] of battery backup operation after a power loss.
    c. Integration shall include control monitoring scheduling change of value notifications .

4. Operator Interface:

    a. Operators shall interface with system and unit controls through the following:

        1) Operator interfaces integral to controllers.
        2) Owner-furnished PC connected to central controller(s).
        3) Web interface through web browser software.
        4) Integration with Building Automation System.

    b. Users shall be capable of interface with controllers for control of indoor units to extent privileges are enabled. Control features available to users shall include the following:

        1) On/off control.
        2) Temperature set-point adjustment.

B. VRF HVAC System Operator Software for PC:

1. Software offered by VRF HVAC system manufacturer shall provide system operators with ability to monitor and control VRF HVAC system(s) from a single dedicated Owner-furnished PC.
2. Software shall provide operator with a graphic user interface to allow monitoring and control of multiple central controllers from a single device location through point-and-click mouse exchange.
3. Plan views shall show building plans with location of indoor units and identification superimposed on plans.
4. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
5. Schedules operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Schedules daily, weekly, and annual events.
6. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
7. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.
8. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
9. Supports Multiple Languages: English
10. Supports Imperial and Metric Temperature Units: .
11. Displays service notifications and error codes.
12. Monitors and displays up to 3000 item error history and 10000 item operation history for regular reporting and further archiving.
13. Monitors and displays cumulative operating time of indoor units.
14. Able to disable and enable operation of individual controllers for indoor units.
15. Information displayed on individual controllers shall also be available for display.
16. Information displayed for outdoor units, including refrigerant high and low pressures [percent capacity] <Insert outdoor unit displays>.

C. Central Controllers:

1. Centralized control for all indoor and outdoor units from a single central controller location.

    a. Include multiple interconnected controllers as required.

2. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
3. Schedule operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.

    a. Sets schedule for daily, weekly, and annual events.
    b. Schedule options available through central controller shall at least include the schedule options of controllers for indoor units.

4. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
5. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.
6. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
7. Service diagnostics tool.
8. Able to disable and enable operation of individual controllers for indoor units.
9. Information displayed on individual controllers shall also be available for display through central controller.
10. Information displayed for outdoor units, including refrigerant high and low pressures [percent capacity] .
11. Multiple RJ-45 ports for direct connection to a local PC and an Ethernet network switch.
12. Operator interface through a backlit, high-resolution color display touch panel[and web accessible through standard web browser software].

D. Wired Controllers for Indoor Units:

1. Single controller capable of controlling multiple indoor units as group.
2. Auto Timeout Touch Screen LCD: Timeout duration shall be adjustable.
3. Multiple Language: [English] [or [Spanish] .
4. Temperature Units: [Fahrenheit] [or] [Celsius] [Fahrenheit and Celsius].
5. On/Off: Turns indoor unit on or off.
6. Hold: Hold operation settings until hold is released.
7. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
8. Temperature Display: 1-degree increments.
9. Temperature Set-Point: Separate set points for Cooling, Heating, and Setback. Adjustable in 1-degree increments.
10. Relative Humidity Display: 1 percent increments.
11. Relative Humidity Set-Point: Adjustable in 1 percent increments.
12. Fan Speed Setting: Select between available options furnished with the unit.
13. Airflow Direction Setting: If applicable to unit, select between available options furnished with the unit.
14. Seven-day programmable operating schedule with up to [eight] events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
15. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
16. Occupancy detection.
17. Service Notification Display: "Filter".
18. Service Run Tests: Limit use by service personnel to troubleshoot operation.
19. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
20. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
21. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost. Battery backup for date and time only.
22. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

E. Wireless Controllers for Indoor Units:

1. Wireless Communication:

    a. Controller communicates to remote-mounted receiver that is wired to indoor unit(s).

        1) Include receivers with wireless controllers as required to complete installation.
        2) Low-voltage power required for receivers shall be powered through non-polar connections to indoor unit.

    b. One wireless controller shall be capable of communicating with one or multiple receivers to control one or multiple indoor units as a group.

2. Controller Battery Life: Three years.
3. Auto Timeout Touch Screen LCD: Timeout duration shall be adjustable.
4. Multiple Language: English .
5. Temperature Units: Fahrenheit.
6. On/Off: Turns indoor unit on or off.
7. Hold: Hold operation settings until hold is released.
8. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
9. Temperature Display: 1-degree increments.
10. Temperature Set-Point: Separate set points for Cooling, Heating, and Setback. Adjustable in 1-degree increments.
11. Relative Humidity Display: 1 percent increments.
12. Relative Humidity Set-Point: Adjustable in 1 percent increments.
13. Fan Speed Setting: Select between available options furnished with the unit.
14. Airflow Direction Setting: If applicable to unit, select between available options furnished with the unit.
15. Seven-day programmable operating schedule with up to eight events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
16. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
17. Occupancy detection.
18. Service Notification Display: "Filter"
19. Service Run Tests: Limit use by service personnel to troubleshoot operation.
20. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
21. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
22. Setting stored in non-volatile memory to ensure that settings are not lost if power is lost. Battery for date and time only.

2.14 SYSTEM REFRIGERANT AND OIL

A. Refrigerant:

1. As required by VRF HVAC system manufacturer for system to comply with performance requirements indicated.
2. ASHRAE 34, Class A1 refrigerant classification.

3. R-410a.

B. Oil:

1. As required by VRF HVAC system manufacturer and to comply with performance requirements indicated.

2.15 SYSTEM CONDENSATE DRAIN PIPING

A. If more than one material is listed, material selection is Contractor's option.

B. Copper Tubing:

1. Drawn-Temper Tubing: According to ASTM B88, Type L
2. Wrought-Copper Fittings: ASME B16.22.
3. Wrought-Copper Unions: ASME B16.22.
4. Solder Filler Metals: ASTM B32, lead-free alloys, and water-flushable flux according to ASTM B813.

C. CPVC plastic pipe according to ASTM F441/F441M, Schedule 40, with socket-type pipe fittings according to ASTM F438 and solvent cement according to ASTM F493.

D. PVC plastic pipe according to ASTM D1785, Schedule 40, with socket-type pipe fittings according to ASTM D2466 and solvent cement according to ASTM D2564, primer according to ASTM F656.

2.16 SYSTEM HYDRONIC PIPING

A. Comply with requirements in Section 232113 "Hydronic Piping" for system piping requirements.

2.17 SYSTEM REFRIGERANT PIPING

A. Comply with requirements in Section 232300 "Refrigerant Piping" for system piping requirements.

B. Refrigerant Piping:

1. Copper Tube: ASTM B280, Type ACR .
2. Wrought-Copper Fittings: ASME B16.22.
3. Brazing Filler Metals: AWS A5.8/A5.8M.

C. Refrigerant Tubing Kits:

1. Furnished by VRF HVAC system manufacturer.

2. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.
3. Standard one-piece length for connecting to indoor units.
4. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.
5. Factory Charge: [Dehydrated air or nitrogen] .

D. Divided-Flow Specialty Fittings: Where required by VRF HVAC system manufacturer for proper system operation, VRF HVAC system manufacturer shall furnish specialty fittings with identification and instructions for proper installation by Installer.

E. Refrigerant Isolation Ball Valves:

1. Description: Uni-body full port design, rated for maximum system temperature and pressure, and factory tested under pressure to ensure tight shutoff. Designed for valve operation without removing seal cap.
2. Seals: Compatible with system refrigerant and oil. Seal service life of at least 20 years.
3. Valve Connections: Flare or sweat depending on size.

2.18 METAL HANGERS AND SUPPORTS

A. Copper Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized or copper-coated steel .

B. Plastic Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, galvanized-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel .

2.19 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Unistrut; Atkore International.
   b. Wesanco, Inc.

2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of [galvanized steel] <Insert material> for use indoors and of [stainless steel] <Insert material> for use outdoors.
7. Metallic Coating for Use Indoors: Electroplated zinc.
8. Plastic Coating for Use Outdoors: PVC.

2.20 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded, zinc-coated steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Indoor Applications: Zinc-coated steel.
2. Outdoor Applications: Stainless steel.

2.21 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:

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. MIRO Industries.
   b. PHP Systems/Design.
   c. RectorSeal HVAC; a CSW Industrials Company.
   d. Rooftop Support Systems; Eberl Iron Works, Inc.

2. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.

   a. Recycled content.>

4. Hardware: Galvanized steel or polycarbonate.
5. Accessories: Protection pads.

C. Low-Profile, Single-Base, Single-Pipe Stand:

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. MIRO Industries.
    b. PHP Systems/Design.
    c. Rooftop Support Systems; Eberl Iron Works, Inc.

2. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.

3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.

    a. Recycled content.>

4. Vertical Members: Two, stainless steel, continuous-thread 1/2-inch rods.
5. Horizontal Member: Adjustable horizontal, stainless steel pipe support channels.
6. Pipe Supports: Clevis hanger.
7. Hardware: Galvanized steel.
8. Accessories: Protection pads.
9. Height: 18 inches above roof .

D. High-Profile, Single-Base, Single-Pipe Stand:

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. MIRO Industries.
    b. PHP Systems/Design.
    c. Rooftop Support Systems; Eberl Iron Works, Inc.

2. Description: Single base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

3. Base: Single vulcanized rubber or molded polypropylene.

    a. Recycled content.>

4. Vertical Members: Two, stainless steel, continuous-thread 1/2-inch rods.
5. Horizontal Member: One, adjustable height, stainless steel pipe support slotted channel or plate.
6. Pipe Supports: Clevis hanger.
7. Hardware: Stainless steel.
8. Accessories: Protection pads, 1/2-inch continuous-thread stainless steel rod.
9. Height: 36 inches above roof .

E. High-Profile, Multiple-Pipe Stand:

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. MIRO Industries.
   b. PHP Systems/Design.
   c. RectorSeal HVAC; a CSW Industrials Company.
   d. Rooftop Support Systems; Eberl Iron Works, Inc.

2. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

3. Bases: Two or more; [vulcanized rubber] [molded polypropylene] .

   a. Recycled content.>

4. Vertical Members: Two or more, stainless steel channels.
5. Horizontal Members: One or more, adjustable height, stainless steel pipe support.
6. Pipe Supports: Clevis hanger.
7. Hardware: Stainless steel.
8. Accessories: Protection pads, 1/2-inch continuous-thread rod.
9. Height: 36 inches above roof.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.22 OUTDOOR EQUIPMENT STANDS

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. MIRO Industries.
2. RectorSeal HVAC; a CSW Industrials Company.
3. RectorSeal HVAC; a CSW Industrials Company.
4. Rooftop Support Systems; Eberl Iron Works, Inc.

B. Description: Individual foot supports with elevated adjustable channel cross bars and clamps/fasteners/bolts for ground or roof-supported outdoor equipment components, without roof membrane penetration, in a prefabricated system that can be modularly assembled on-site.

C. Foot Material: Rubber or polypropylene.

D. Rails Material: Hot-dip galvanized carbon steel.

2.23 MISCELLANEOUS SUPPORT MATERIALS

A. Grout: ASTM C1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

B. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

C. Threaded Rods: Continuously threaded. Zinc-plated steel or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar material as rods.

2.24 PIPING AND TUBING INSULATION

A. Comply with requirements in Section 230719 "HVAC Piping Insulation" for system piping insulation requirements.

B. Condensate Drain Piping and Tubing Insulation and Jacket Requirements:

1. Flexible Elastomeric Insulation:

   a. Closed-cell, sponge- or expanded-rubber materials, complying with ASTM C534, Type I for tubular materials.
   b. Indoors: 1/2 inch thick.
   c. Outdoors: 3/4 inch thick.

2. Field-Applied Jacket:

   a. Concealed: None required.
   b. Indoors, Exposed to View: Factory ASJ with vaport barrier.
   c. Outdoors, Exposed to View: Aluminum, smooth, 0.020 inch thick .

C. Refrigerant Tubing Insulation and Jacket Requirements:

1. Flexible Elastomeric Insulation:

   a. Closed-cell, sponge- or expanded-rubber materials, complying with ASTM C534, Type I for tubular materials.
   b. Indoors: 1 inch thick.
   c. Outdoors: 1 inch thick.

2. Field-Applied Jacket:

   a. Concealed: None required.
   b. Indoors, Exposed to View: None required

c. Outdoors, Exposed to View: [None required] [Aluminum, smooth, 0.020 inch thick] .

D. Flexible Elastomeric Insulation Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Llow emitting adhesives.>

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Low emitting adhesives.>

F. Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. Sealants.>

2.25 SYSTEM CONTROL CABLE AND RACEWAYS

A. Low-Voltage Control Cabling:

1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

B. TIA-485A Network Cabling:

1. Standard Cable: NFPA 70, Type CMG.
2. Plenum-Rated Cable: NFPA 70, Type CMP.

C. Ethernet Network Cabling: TIA-568-C.2 Category 6a cable with RJ-45 connectors.

D. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for control wiring and cable raceways.

2.26 MATERIALS

A. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for steel sheet.

B. Stainless Steel:

1. Manufacturer's standard grade for casing.
2. Manufacturer's standard type, ASTM A240/A240M for bare steel exposed to airstream or moisture.

C. Galvanized Steel: ASTM A653/A653M.

D. Aluminum: ASTM B209.

E. Comply with Section 230546 "Coatings for HVAC" for corrosion-resistant coating.

F. Corrosion-Resistant Coating: Coat with a corrosion-resistant coating capable of withstanding a 3000 -hour salt-spray test according to ASTM B117.

1. Standards:

a. ASTM B117 for salt spray.
b. ASTM D2794 for minimum impact resistance of 100 in-lb .
c. ASTM B3359 for cross-hatch adhesion of 5B.

2. Application: Spray.
3. Thickness: 1 mil.
4. Gloss: Minimum gloss of 60 on a 60-degree meter.

2.27 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect factory-assembled equipment.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports for historical record. Submit reports only if requested.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.
2. Maintain clearances required by governing code.

B. Loose Components: Install components, devices, and accessories furnished by manufacturer, with equipment, that are not factory mounted.

1. Loose components shall be installed by system Installer under supervision of manufacturer's service representative.

C. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

D. Indoor Unit Installations:

1. Install units to be level and plumb while providing a neat and finished appearance.
2. Unless otherwise required by VRF HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of 3/8 inch.
3. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.
4. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.
5. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.
6. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.
7. Provide lateral bracing if needed to limit movement of suspended units to not more than [0.25 inch].
8. For floor- and wall-mounted units that are exposed, conceal piping and tubing, controls, and electrical power serving units within walls.
9. Floor-mounted units located in [mechanical] rooms.
10. Install floor-mounted units on support structure indicated on Drawings.
11. Install floor-mounted units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
12. Attachment: Install hardware for proper attachment to supported equipment.
13. Grouting: Place grout under equipment supports and make bearing surface smooth.

E. Outdoor Unit Installations:

1. Install units to be level and plumb while providing a neat and finished appearance.
2. Install outdoor units on support structures indicated on Drawings.
3. Pad-Mounted Installations: Install outdoor units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

    a. Attachment: Install anchor bolts to elevations required for proper attachment to supported equipment.
    b. Grouting: Place grout under equipment supports and make bearing surface smooth.

4. Roof-Mounted Installations: Install outdoor units on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, stainless-steel fasteners.

3.2 GENERAL REQUIREMENTS FOR PIPING AND TUBING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping and tubing to permit valve servicing.

F. Install piping and tubing at indicated slopes.

G. Install piping and tubing free of sags.

H. Install fittings for changes in direction and branch connections.

I. Install piping and tubing to allow application of insulation.

J. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.

K. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

L. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 CONDENSATE DRAIN PIPE AND TUBING INSTALLATION

A. General Requirements for Drain Piping and Tubing:

1. Install a union in piping at each threaded unit connection.
2. Install an adjustable stainless-steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:

    a. Details indicated on Drawings.
    b. Manufacturer's requirements.
    c. Governing codes.
    d. In the absence of requirements, comply with requirements of ASHRAE handbooks.

4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.

5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.

B. Gravity Drains:

1. Slope piping from unit connection toward drain termination at a constant slope of not less than [one to two] percent.

C. Pumped Drains:

1. If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.4 HYDRONIC PIPING AND TUBING INSTALLATION

A. Comply with requirements for hydronic pipe and tubing specified in Section 232113 "Hydronic Piping."

B. Comply with requirements for hydronic specialties specified in Section 232116 "Hydronic Piping Specialties."

C. Comply with requirements for ball valves specified in Section 230523.12 "Ball Valves for HVAC Piping."

D. Comply with requirements for butterfly valves specified in Section 230523.13 "Butterfly Valves for HVAC Piping."

E. Comply with requirements for check valves specified in Section 230523.14 "Check Valves for HVAC Piping."

F. Install continuous-thread hanger rods and [elastomeric] [spring] hangers of size required to support equipment weight.

1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

G. Where installing piping and tubing adjacent to equipment, allow space for service and maintenance.

3.5 REFRIGERANT PIPING AND TUBING INSTALLATION

A. Refrigerant Tubing Kits:

1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
2. Support tubing using hangers and supports indicated at intervals not to exceed [5 feet]. Minimum rod size, 1/4 inch.
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Install refrigerant piping according to ASHRAE 15 and governing codes.

C. Select system components with pressure rating equal to or greater than system operating pressure.

D. Install piping as short and direct as possible, with a minimum number of joints and fittings.

E. Arrange piping to allow inspection and service of equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

F. Install refrigerant piping and tubing in protective conduit where installed belowground.

G. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

H. Unless otherwise required by VRF HVAC system manufacturer, slope refrigerant piping and tubing as follows:

1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps to entrain oil in vertical runs.
4. Liquid lines may be installed level.

I. When brazing, remove or protect components that could be damaged by heat.

J. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

K. Joint Construction:

1. Ream ends of tubes and remove burrs.
2. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
3. Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

    a. Use Type BCuP (copper-phosphorus) alloy for joining copper fittings with copper tubing.
    b. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.

3.6 PIPE AND TUBING INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated. Installation to maintain a continuous vapor barrier.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are unavailable, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

E. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 DUCT, ACCESSORIES, AND AIR OUTLETS INSTALLATION

A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.

B. Comply with requirements for metal ducts specified in Section 233113 "Metal Ducts."

C. Comply with requirements for nonmetal ducts specified in Section 233116 "Nonmetal Ducts."

D. Comply with requirements for air duct accessories specified in Section 233300 "Air Duct Accessories."

E. Comply with requirements for flexible ducts specified in Section 233346 "Flexible Ducts."

F. Comply with requirements for air diffusers specified in Section 233713.13 "Air Diffusers."

G. Comply with requirements for registers and grilles specified in Section 233713.23 "Registers and Grilles."

3.8 SOFTWARE

A. Cybersecurity:

1. Software:

a. Coordinate security requirements with [IT department] [CIO] .
b. Ensure that latest stable software release is installed and properly operating.
c. Disable or change default passwords to password using a combination of uppercase and lower letters, numbers, and symbols at least eight characters in length. Record passwords and turn over to party responsible for system operation and administration.

2. Hardware:

a. Coordinate location and access requirements with [IT department] [CIO] .
b. Enable highest level of wireless encryption that is compatible with Owner's ICT network.
c. Disable dual network connections.

3.9 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of manufacturer's service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Refrigerant Tubing Positive Pressure Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing installation, pressurize tubing systems to a test pressure of not less than [1.2] times VRF HVAC system operating pressure, but not less than [600 psig] , using [dry nitrogen] .
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of [24] hours. Allowance for pressure changes attributed to changes in ambient temperature are acceptable.
4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.
    f. Outdoor temperature at start of test.
    g. Name of person ending test, company name, phone number, and e-mail address.
    h. Date and time at end of test.
    i. Test pressure at end of test.
    j. Outdoor temperature at end of test.
    k. Remarks:

5. Submit test reports for Project record.

C. Refrigerant Tubing Evacuation Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing positive-pressure testing, evacuate tubing systems to a pressure of [500] microns.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of [one] hour(s) with no change.
4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.
    f. Outdoor temperature at start of test.
    g. Name of person ending test, company name, phone number, and e-mail address.
    h. Date and time at end of test.
    i. Test pressure at end of test.
    j. Outdoor temperature at end of test.
    k. Remarks:

5. Submit test reports for Project record.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

D. System Refrigerant Charge:

1. Using information collected from the refrigerant tubing evacuation testing, system Installer shall consult variable refrigerant system manufacturer to determine the correct system refrigerant charge.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.
3. System refrigerant charging shall be witnessed by system manufacturer's representative.
4. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

E. Products will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.11 STARTUP SERVICE

A. Engage a VRF HVAC system manufacturer's service representative to perform system(s) startup service.

1. Service representative shall be a factory-trained and -authorized service representative of VRF HVAC system manufacturer.
2. Complete startup service of each separate system.
3. Complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).
2. Check each indoor unit's response to demand for cooling and heating.
3. Check each indoor unit's response to changes in airflow settings.
4. Check each indoor unit, HRCU, and outdoor unit for proper condensate removal.
5. Check sound levels of each indoor and outdoor unit.

C. Installer shall accompany manufacturer's service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.

1. Installer shall correct deficiencies found during startup service for reverification.

D. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.

2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.
3. Manufacturer shall electronically record not less than [two] hours of continuous operation of each system and submit with report for historical reference.

    a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite Commissioning Agent to witness startup service procedures.
2. Provide written notice not less than 20 business days before start of startup service.

3.12 ADJUSTING

A. Adjust equipment and components to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature and humidity set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches and circuit-breaker trip ranges according to VRF HVAC system manufacturer's written instructions, and as indicated.

D. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to [two] visits to Project during other-than-normal occupancy hours for this purpose.

3.13 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within [two] years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.14 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's [employed training instructor] [or] [factory-authorized service representative] to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Fire-alarm wire and cable.
4. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire; brand of Belden, Inc.
2. Belden Inc.
3. Encore Wire Corporation.
4. General Cable; Prysmian Group North America.
5. Southwire Company, LLC.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type RHH and Type RHW-2: Comply with UL 44.
2. Type USE-2 and Type SE: Comply with UL 854.
3. Type THHN and Type THWN-2: Comply with UL 83.
4. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
5. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; Atkore International.
2. Alpha Wire; brand of Belden, Inc.
3. Encore Wire Corporation.
4. General Cable; Prysmian Group North America.
5. Southwire Company, LLC.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Aluminum, interlocked.

I. Jacket: PVC applied over armor.

2.3 FIRE-ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Wire & Cable Inc.
2. Prysmian Cables and Systems; Prysmian Group North America.
3. Radix Wire.
4. Southwire.
5. West Penn Wire; brand of Belden, Inc.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 16 AWG.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M Electrical Products.
2. ABB, Electrification Business.
3. AFC Cable Systems; Atkore International.
4. Hubbell Utility Solutions; Hubbell Incorporated.
5. ILSCO.
6. Ideal Industries, Inc.
7. NSi Industries LLC.
8. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
9. TE Connectivity Ltd.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

A. Comply with NFPA 72.

B. Wiring Method: Install wiring in metal pathway according to Section 28 0528 "Pathways for Electronic Safety and Security."

1. Install plenum cable in environmental airspaces, including plenum ceilings.
2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system must be installed in a dedicated pathway system.

    a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.

3. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is permitted.
4. Signaling Line Circuits: Power-limited fire-alarm cables must not be installed in the same cable or pathway as signaling line circuits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

3.5 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

D. Comply with requirements in Section 28 4621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 8413 "Penetration Firestopping."

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.
3. Foundation steel electrodes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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 UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries Inc.; Electrical Products Division, LLC.
6. Harger Lighting and Grounding.
7. ILSCO.
8. O-Z/Gedney; A Brand of the EGS Electrical Group.
9. Robbins Lighting, Inc.
10. Siemens Power Transmission & Distribution, Inc..

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, [**1/4 by 4 inches**] <**Insert dimensions**> in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

J. Straps: Solid copper, copper lugs. Rated for 600 A.

K. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

L. Water Pipe Clamps:

1. Mechanical type, two pieces with zinc-plated bolts.

a. Material: Die-cast zinc alloy.
b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.

1. Bury at least 30 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Substations and Pad-Mounted Equipment: 5 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Allied Tube & Conduit; Atkore International.
c. Cooper B-line; brand of Eaton, Electrical Sector.
d. Unistrut; Atkore International.
e. Wesanco, Inc.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs

shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-line; brand of Eaton, Electrical Sector.
2) Empire Industries, Inc.
3) Hilti, Inc.
4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F 3125/F 3125M, Grade A325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.

B. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb .

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

END OF SECTION

SECTION 26 0533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Type EMT-S raceways and elbows.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type FMC-S and Type FMC-A raceways.
4. Type IMC raceways.
5. Type LFMC raceways.
6. Type PVC raceways and fittings.
7. Fittings for conduit, tubing, and cable.
8. Threaded metal joint compound.
9. Solvent cements.
10. Surface metal raceways and fittings.
11. Metallic outlet boxes, device boxes, and covers.
12. Junction boxes, and pull boxes.
13. Cover plates for device boxes.
14. Hoods for outlet boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Wireways and auxiliary gutters.
2. Surface metal raceways.
3. Floor boxes.
4. Cabinets and cutout boxes.

PART 2 - PRODUCTS

2.1 TYPE EMT-S RACEWAYS AND ELBOWS

A. Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.

e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 797 and UL Category Control Number FJMX.
2) Material: Steel.
3) Exterior Coating: Zinc.
4) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 1/2 inch.
2) Colors: As indicated on Drawings.

2.2 TYPE ERMC-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 6 and UL Category Control Number DYIX.
2) Exterior Coating: Zinc.
3) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 1/2 inch.
2) Colors: As indicated on Drawings.

2.3 TYPE FMC-S AND TYPE FMC-A RACEWAYS

A. Steel Flexible Metal Conduit (FMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.

2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standard: UL 1 and UL Category Control Number DXUZ.
      2) Material: Steel.

   c. Options:

      1) Minimum Trade Size: 1/2 inch.
      2) Colors: As indicated on Drawings.

2.4 TYPE IMC RACEWAYS

A. Steel Electrical Intermediate Metal Conduit (IMC):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.

2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standard: UL 1242 and UL Category Control Number DYBY.

2) Exterior Coating: Zinc.
3) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 1/2 inch.
2) Colors: As indicated on Drawings.

2.5 TYPE LFMC RACEWAYS

A. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.
2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standard: UL 360 and UL Category Control Number DXHR.
      2) Material: Steel.

   c. Options:

      1) Minimum Trade Size: 1/2 inch.

3. Colors: As indicated on Drawings.

2.6 TYPE PVC RACEWAYS AND FITTINGS

A. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.

h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

b. General Characteristics:

1) Reference Standards: UL 651 and UL Category Control Number DZYR.
2) Dimensional Specifications: Schedule 40.

c. Options:

1) Minimum Trade Size: 1/2 inch.

B. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

b. General Characteristics:

1) Reference Standards: UL 651 and UL Category Control Number DZYR.
2) Dimensional Specifications: Schedule 80.

c. Options:

1) Minimum Trade Size: 1/2 inch.

2.7 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Fittings for Type ERMC, Type IMC, and Type PVC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.

g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number DWTT.
2) Material: Steel.
3) Coupling Method: Compression coupling or Raintight compression coupling with distinctive color gland nut.

c. Options:

1) Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

B. Fittings for Type EMT Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number FKAV.
2) Material: Steel.
3) Coupling Method: Setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.

c. Options:

1) Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

C. Fittings for Type FMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.

c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number ILNR.

D. Fittings for Type LFMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number DXAS.

2.8 SOLVENT CEMENTS

A. Solvent Cements for Type PVC Raceways and Fittings:
1. Applicable Standards:

a. General Characteristics:

1) Reference Standards: As recommended by conduit manufacturer in accordance with UL 514B and UL Category Control Number DWTT.

2.9 SURFACE METAL RACEWAYS AND FITTINGS

A. Surface Metal Raceways and Fittings with Metal Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by:
a. Legrand; Wiremold

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 5 and UL Category Control Number RJBT.

c. Options:

1) Galvanized steel base with snap-on covers.
2) Prime coated, ready for field painting.
3) Wiring Channels: [**Single**] [**Dual**] [**Triple**]. Multiple channels must be capable of housing a standard 20 to 30 A NEMA device flush within the raceway.

B. Surface Metal Raceways and Fittings with Nonmetallic Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by:
a. Legrand; Wiremold
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards:

a) UL 5 and UL Category Control Number RJBT.
b) UL 94, V-0 requirements for self-extinguishing characteristics.

c. Options:

1) [**Galvanized steel**] [**Aluminum**] base with snap-on covers.
2) Provide texture and color selected by Architect from [**manufacturer's standard**] [**custom**] colors.
3) Wiring Channels: [**Single**] [**Dual**] [**Triple**]. Multiple channels must be capable of housing a standard 20 to 30 A NEMA device flush within the raceway.

2.10 METALLIC OUTLET BOXES, DEVICE BOXES, AND COVERS

A. Metallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

c. Options:

1) Material: Sheet steel.
2) Sheet Metal Depth: Minimum 1.5 inch.
3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

B. Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

C. Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

c. Options:

1) Material: Sheet steel.
2) Sheet Metal Depth: minimum 1.5 inch.
3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

D. Metallic Floor Boxes and Floor Box Covers:

1. Description: Box mounted in floor with floor box cover and other components to complete floor box enclosure.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

E. Metallic Recessed Access-Floor Boxes and Recessed Floor Box Covers:

1. Description: Floor box with provisions for mounting wiring devices below floor surface and floor box cover with provisions for passage of cords to recessed wiring devices mounted within floor box.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

F. Metallic Concrete Boxes and Covers:

1. Description: Box intended for use in poured concrete.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

2.11 JUNCTION BOXES AND PULL BOXES

A. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 1.

B. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 1.

C. Indoor Polymeric Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 1.

D. Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

E. Outdoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

F. Outdoor Polymeric Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

2.12 HOODS FOR OUTLET BOXES

A. Retractable or Reattachable Hoods for Outlet Boxes:

1. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.

2) Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
3) Mounts to box using fasteners different from wiring device.

c. Options:

1) Provides clear, weatherproof, "while-in-use" cover.

B. Extra-Duty, While-in-Use Hoods for Outlet Boxes:

1. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
2) Marked "Extra-Duty" in accordance with UL 514D.
3) Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
4) Mounts to box using fasteners different from wiring device.

c. Options:

1) Provides clear, weatherproof, "while-in-use" cover.
2) Manufacturer may combine nonmetallic device box with hood as extra-duty rated assembly.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.

B. Outdoors:

1. Exposed Conduit: ERMC or IMC.
2. Concealed Conduit, Aboveground: ERMC or IMC.
3. Direct-Buried Conduit: PVC-40.
4. Concrete-Encased Conduit Not in Trench: PVC-40.
5. Concrete-Encased Conduit in Trench: PVC-40.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

C. Indoors:
1. Exposed and Subject to Physical Damage: ERMC. Raceway locations include the following:
    a. Loading docks.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums.
2. Exposed, Not Subject to Physical Damage: IMC.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Damp or Wet Locations: ERMC or IMC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC.

D. Stub-ups to Above Recessed Ceilings: Provide EMT, IMC, or ERMC for raceways.

E. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
1. ERMC and IMC: Provide threaded type fittings unless otherwise indicated.

3.2 SELECTION OF BOXES AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:
1. Outdoors:
    a. Type 3R unless otherwise indicated.
    b. Locations Exposed to Hosedown: Type 4.
    c. Locations Subject to Potential Flooding: Type 6P.
    d. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
    e. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
    f. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.
2. Indoors:
    a. Type 1 unless otherwise indicated.
    b. Damp or Dusty Locations: Type 12.
    c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4.
    f. Locations Exposed to Hosedown: Type 4.
    g. Locations Exposed to Brief Submersion: Type 6P.
    h. Locations Exposed to Prolonged Submersion: Type 6P.
    i. Locations Exposed to Corrosive Agents: Type 4X.
    j. Locations Exposed to Spraying Oil or Coolants: Type 13.

C. Exposed Boxes Installed Less Than 6.5 ft. Above Floor:

1. Boxes with knockouts or unprotected openings are prohibited.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
3. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.
4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Comply with NECA NEIS 111 for installation of nonmetallic raceways.
6. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
7. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch trade size and insulated throat metal bushings on 1-1/2 inch trade size and larger conduits terminated with locknuts.
8. Raceway Terminations at Locations Subject to Moisture or Vibration:

    a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.
2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft. above finished floor.
3. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
4. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
5. Support conduit within 12 inch of enclosures to which attached.
6. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
7. 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 interior of raceways at the following points:

    a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    b. Where an underground service raceway enters a building or structure.

c. Conduit extending from interior to exterior of building.
d. Conduit extending into pressurized duct and equipment.
e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
f. Where otherwise required by NFPA 70.

8. Do not install raceways or electrical items on "explosion-relief" walls or rotating equipment.
9. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
10. Keep raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
11. Cut conduit perpendicular to the length. For conduits 2 inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
12. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types ERMC and IMC:

a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

2. Types FMC and LFMC:

a. Comply with NEMA RV 3. Provide a maximum of 36 inch of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

3. Type PVC:

a. Do not install Type PVC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
b. Comply with manufacturer's written instructions for solvent welding and fittings.

D. Raceways Embedded in Slabs:

1. Run raceways larger than 1 inch trade size below concrete slab..
2. Arrange raceways to cross building expansion joints with expansion fittings at right angles to the joint.
3. Arrange raceways to ensure that each is surrounded by a minimum of 2 inch of concrete without voids.
4. Do not embed threadless fittings in concrete unless locations have been specifically approved by Architect.

E. Stub-ups to Above Recessed Ceilings:

1. Provide EMT, IMC, or ERMC for raceways.

2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

F. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
2. EMT: Provide setscrew, steel fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

G. Expansion-Joint Fittings:

1. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft.. Install in runs of aboveground ERMC and EMT conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft..
2. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
5. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

H. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty.

3.4 INSTALLATION OF SURFACE RACEWAYS

A. Install surface raceways only where indicated on Drawings.

B. Install surface raceway with a minimum 2 inch radius control at bend points.

C. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inch mm) and with no less than two supports per straight raceway section. Support surface raceway in accordance with manufacturer's written instructions. Tape and glue are unacceptable support methods.

3.5 INSTALLATION OF BOXES AND ENCLOSURES

A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.

B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.

C. 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, whether installed indoors or outdoors.

D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

E. Locate boxes so that cover or plate will not span different building finishes.

F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.

G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.

H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

I. Set metal floor boxes level and flush with finished floor surface.

J. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

K. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.

L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

M. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
2. Provide gaskets for wallplates and covers.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.8 CLEANING

A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION

SECTION 26 0543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Handholes and boxes.
4. Manholes.

1.2 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, boxes.
4. Include warning tape.
5. Include warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include duct entry provisions, including locations and duct sizes.
c. Include reinforcement details.
d. Include frame and cover design and manhole frame support rings.
e. Include [Ladder] [Step] details.
f. Include grounding details.
g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
h. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.

b. Include duct entry provisions, including locations and duct sizes.
c. Include cover design.
d. Include grounding details.
e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.4 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.5 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

B. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.

4. CertainTeed Corporation.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Spiraduct/AFC Cable Systems, Inc.
11. <Insert manufacturer's name>.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-80 and Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 26 0553 "Identification for Electrical Systems."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.

    a. Color: Red dye added to concrete during batching.
    b. Mark each plank with "ELECTRIC" in 2-inch- high, 3/8-inch- deep letters.

2.4 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Green.
2. Configuration: Units shall be designed for flush burial and have closed bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. NewBasis.
d. Quazite: Hubbell Power System, Inc.

2.5 UTILITY STRUCTURE ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bilco Company (The).
2. Campbell Foundry Company.
3. Christy Concrete Products.
4. East Jordan Iron Works, Inc.
5. Elmhurst-Chicago Stone Co.
6. McKinley Iron Works, Inc.
7. Neenah Foundry Company.
8. NewBasis.
9. Oldcastle Precast Group.
10. Osburn Associates, Inc.
11. Pennsylvania Insert Corporation.
12. Quazite:Hubbell Power Systems, Inc.
13. Rinker Group, Ltd.
14. Riverton Concrete Products.
15. Underground Devices, Inc.
16. Utility Concrete Products, LLC.
17. Utility Vault Co.
18. Wausau Tile Inc.

B. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch- diameter eye, and 1-by-4-inch bolt.

1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.

C. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch- diameter eye, rated 2500-lbf minimum tension.

D. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.

E. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

F. Cover Hooks: Heavy duty, designed for lifts 60 lbf and greater. Two required.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes 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. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Construction Manager if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Construction Manager.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 31 1100 "Clearing and Grubbing." Remove and stockpile topsoil for reapplication according to Section 31 1100 "Clearing and Grubbing."

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank unless otherwise indicated.

C. Underground Ducts Crossing Paved Paths Walks and Driveways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.3 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 25 feet, both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Duct Entrances to Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

G. Pulling Cord: Install 100-lbf- test nylon cord in empty ducts.

H. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 31 2000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than five spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing

last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 31 2000 "Earth Moving" for installation of backfill materials.

a. Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.
b. Place minimum 6 inches of engineered fill above concrete encasement of duct bank.

I. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.

J. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.4 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and boxes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for ducts and 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 GROUNDING

A. Ground underground ducts and utility structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 0526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.7 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

SECTION 26 0544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve seal systems.
4. Grout.
5. Pourable sealants.
6. Foam sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Wall Sleeves, Steel:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, LLC.
   b. CCI Piping Systems.
   c. Flexicraft Industries.
   d. GPT; an EnPro Industries company.

2. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Pipe Sleeves, PVC:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CCI Piping Systems.
   b. GPT; an EnPro Industries company.

c. Metraflex Company (The).

2. Description: ASTM D1785, Schedule 40.

C. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Benefast.
b. Specified Technologies, Inc.

2. Description: Galvanized-steel sheet; thickness not less than 0.0239 inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abesco Fire LLC.
b. Specified Technologies, Inc.
c. Wiremold; Legrand North America, LLC.

2. Description:

a. Material: Galvanized sheet steel.
b. Minimum Metal Thickness:

1) For sleeve cross-section rectangle perimeter less than 50 inch and with no side larger than 16 inch, thickness must be 0.052 inch.
2) For sleeve cross-section rectangle perimeter not less than 50 inch or with one or more sides larger than 16 inch, thickness must be 0.138 inch.

2.3 SLEEVE SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, LLC.
2. CALPICO, Inc.
3. Flexicraft Industries.
4. Metraflex Company (The).
5. Proco Products, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.5 POURABLE SEALANTS

A. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.6 FOAM SEALANTS

A. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 9200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve seal system is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

E. Underground, Exterior-Wall and Floor Penetrations:
1. Install steel pipe sleeves. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

B. Install conduits and cable with no crossings within the sleeve.

C. Fill opening around conduits and cables with expanding foam without leaving voids.

D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.3 INSTALLATION OF SLEEVE SEAL SYSTEMS

A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:

   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.

4. Color for Neutral: White.
5. Color for Equipment Grounds: Green.
6. Colors for Isolated Grounds: Green two or more yellow stripes.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field.
2. Panelboards shall be labeled with their name, voltage, phase, main & bus ampacities, and where they are fed from panelboard or switchboard name and position.
3. Transformers shall be labeled with their name, voltages, phase, kVA rating, and where they are fed from panelboard or switchboard name and position, what panelboard or switchboard they feed.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors.
b. 3-1/2 by 5 inches for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameter and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

1. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and telecommunication utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.
c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

3. Tag: Type I:

a. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Thickness: 4 mils.
d. Weight: 18.5 lb/1000 sq. ft..
e. Tensile according to ASTM D882: 30 lbf and 2500 psi.

4. Tag: Type ID:

a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Overall Thickness: 5 mils.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft..
f. Tensile according to ASTM D882: 70 lbf and 4600 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 TAGS

A. Write-on Tags:

1. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1.

2. Preprinted aluminum signs,punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

   a. For signs up to 20 sq. in., minimum 1/16 inch thick.
   b. For signs larger than 20 sq. in., 1/8 inch thick.
   c. Engraved legend with white letters on a dark gray background.
   d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
   e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

K. Vinyl Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

L. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

M. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

N. Self-Adhesive Labels:

1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

O. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

S. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

T. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

U. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

V. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

W. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

X. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

Y. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

Z. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

G. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

H. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

I. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

J. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

K. Operating Instruction Signs: Self-adhesive labels.

L. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION

SECTION 26 2413

SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.

1.2 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

B. 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. Detail utility company's metering provisions with indication of approval by utility company.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. 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.
9. Include schematic and wiring diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1.5 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 104 deg F.
b. Altitude: Not exceeding 6600 feet.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SWITCHBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Comply with NEMA PB 2.

E. Comply with NFPA 70.

F. Comply with UL 891.

G. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

H. Indoor Enclosures: Steel, NEMA 250, Type 1.

I. Outdoor Enclosures: Type 3R.

1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
2. Enclosure: Downward, rearward sloping roof; bolt-on rear covers for each section, with provisions for padlocking.

J. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
2. Space-Heater Power Source: Transformer, factory installed in switchboard.

K. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

L. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

M. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

N. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

O. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, with copper circuit-breaker line connections.
3. Ground Bus: 1/4-by-2-inch- hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
4. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
5. Disconnect Links:

    a. Isolate neutral bus from incoming neutral conductors.
    b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.

6. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

P. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.2 SURGE PROTECTION DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 2.

C. Features and Accessories:

1. Integral disconnect switch.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Indicator light display for protection status.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
5. Surge counter.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

F. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Line to Line: 1000 V.

G. SCCR: Equal or exceed 100 kA.

H. Nominal Rating: 20 kA.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
   a. Long- and short-time pickup levels.
   b. Long and short time adjustments.
   c. Ground-fault pickup level, time delay, and I squared t response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. MCCB Features and Accessories:

   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
   c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.4 INSTRUMENTATION

A. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
d. Megawatts: Plus or minus 1 percent.
e. Megavars: Plus or minus 1 percent.
f. Power Factor: Plus or minus 1 percent.
g. Frequency: Plus or minus 0.1 percent.
h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
j. Contact devices to operate remote impulse-totalizing demand meter.

2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

2.5 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

2.6 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.

B. Install switchboards and accessories according to NEMA PB 2.1.

C. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 03 3000 "Cast-in-Place Concrete."

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to switchboards.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

H. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Acceptance Testing:

a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment per NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

B. Switchboard will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for SPD as installed in panelboard.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 24 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2. Height: 84 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

E. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

F. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

G. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices.

Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

H. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: As indicated on drawings.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: As indicated on drawings.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.
e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:
1) Long- and short-time pickup levels.
2) Long and short time adjustments.
3) Ground-fault pickup level, time delay, and I squared T response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Subfeed Circuit Breakers: Vertically mounted.
8. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.5 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NEMA PB 1.1.

C. Mount top of trim 90 inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box.

E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

H. Install filler plates in unused spaces.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 0553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 26 0553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Toggle switches, 120/277 V, 20 A.
4. Decorator-style devices, 20 A.
5. Occupancy sensors.
6. Wall plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pass & Seymour/Legrand (Pass & Seymour).
2. Hubbell Incorporated; Wiring Device Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Cooper Wiring Devices; Division of Cooper Industries Inc. (Cooper).

B. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Comply with NFPA 70.

D. RoHS compliant.

E. Comply with NEMA WD 1.

F. Device Color:

1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.

G. Wall Plate Color: For plastic covers, match device color.

H. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.

B. Tamper-Resistant Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Weather-Resistant Duplex Receptacle, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.3 STANDARD-GRADE RECEPTACLES, 125 V, 15 A

A. Duplex Receptacles, 125 V, 15 A:
1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498 and FS W-C-596.

B. Tamper-Resistant Duplex Receptacles, 125 V, 15 A:

1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498 and FS W-C-596.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Weather-Resistant Duplex Receptacle, 125 V, 15 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 15 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.4 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.5 TOGGLE SWITCHES, 120/277 V, 15 A

A. Single-Pole Switches, 120/277 V, 15 A:
1. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 15 A:
1. Comply with UL 20 and FS W-S-896.
2. Description: Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
3. Standards: Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 15 A:
1. Comply with UL 20 and FS W-S-896.

D. Four-Way Switches, 120/277 V, 15 A:
1. Standards: Comply with UL 20 and FS W-S-896.

2.6 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:
1. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 20 A:
1. Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 20 A:
1. Comply with UL 20 and FS W-S-896.

D. Four-Way Switches, 120/277 V, 20 A:
1. Standards: Comply with UL 20 and FS W-S-896.

2.7 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology:
1. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
2. Standards: Comply with UL 20.
3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
4. Adjustable time delay of 10 minutes.
5. Able to be locked to Automatic or Manual-On mode.
6. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
7. Connections: Provisions for connection to BAS.
8. Connections: RJ-45 communications outlet.
9. Connections: Integral wireless networking.

2.8 DIMMERS

2.9 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Device Installation:

1. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Receptacles:

   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Motor-control centers.
c. Panelboards.
d. Switchboards.
e. Enclosed controllers.
f. Enclosed switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bussmann; Eaton, Electrical Sector.
2. Littelfuse, Inc.
3. Mersen USA.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.

3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, time delay.
4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, time delay.
5. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
7. Type T: 600-V, zero- to 800-A rating, 200 kAIC, time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.2 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Molded-case switches.
5. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 600-V ac.
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations.

E. MCCBs shall be equipped with a device for locking in the isolated position.

F. Lugs shall be suitable for 75 deg C rated wire.

G. Standards: Comply with UL 489 with interrupting capacity to comply with available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

I. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Long- and short-time pickup levels.
2. Long- and short-time time adjustments.
3. Ground-fault pickup level, time delay, and I-squared t response.

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12).

C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.2 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

F. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0573.16 "Coordination Studies."

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) 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.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) 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.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.

h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 26 2913

ENCLOSED CONTROLLERS

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 the following enclosed controllers rated 600 V and less:

1. Full-voltage manual.
2. Full-voltage magnetic.
3. Reduced-voltage magnetic.
4. Reduced-voltage solid state.
5. Multispeed.

B. Related Section:

1. Section 262923 "Variable-Frequency Motor Controllers" for general-purpose, ac, adjustable-frequency, pulse-width-modulated controllers for use on variable torque loads in ranges up to 200 hp.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. OCPD: Overcurrent protective device.

G. SCR: Silicon-controlled rectifier.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Factory-installed devices.

c. Nameplate legends.
d. Short-circuit current rating of integrated unit.
e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.
f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for enclosed controllers and installed components.
2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
3. Manufacturer's written instructions for setting field-adjustable overload relays.
4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage solid-state controllers.

1.6 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses for Fused Switches: Equal to [10] <Insert number> percent of quantity installed for each size and type, but no fewer than [three] <Insert number> of each size and type.
2. Control Power Fuses: Equal to [10] <Insert number> percent of quantity installed for each size and type, but no fewer than [two] <Insert number> of each size and type.
3. Indicating Lights: [Two] <Insert number> of each type and color installed.
4. Auxiliary Contacts: Furnish [one] <Insert number> spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish [three] <Insert number> spares for each size and type of magnetic contactor installed.
6. <Insert extra materials>.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside

controllers; [install temporary electric heating, with at least 250 W per controller] [connect factory-installed space heaters to temporary electrical service].

1.9 PROJECT CONDITIONS

A. Interruption of Existing Electrical Systems: Do not interrupt electrical systems in facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of electrical systems.
2. Indicate method of providing temporary utilities.
3. Do not proceed with interruption of electrical systems without Architect's written permission.
4. Comply with NFPA 70E.

1.10 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FULL-VOLTAGE CONTROLLERS

A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
c. Rockwell Automation, Inc.; Allen-Bradley brand.
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric.

2. Configuration: [Nonreversing] [Reversing] [Two speed].
3. Surface mounting.
4. Red pilot light.
5. Additional Nameplates: [FORWARD and REVERSE for reversing switches] [HIGH and LOW for two-speed switches] <Insert special markings>.

C. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
c. Rockwell Automation, Inc.; Allen-Bradley brand.

d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric.

2. Configuration: [Nonreversing] [Two speed].
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, [Class 10] <Insert class> tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button[; bimetallic type] [; melting alloy type].
4. [Flush] [Surface] mounting.
5. [Red] [Green] pilot light.
6. Additional Nameplates: [HIGH and LOW for two-speed controllers] <Insert special markings>.

D. Integral Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
c. Rockwell Automation, Inc.; Allen-Bradley brand.
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric.
f. <Insert manufacturer's name>.

3. Configuration: [Nonreversing] [Reversing] [Two speed].
4. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, [Class 10] <Insert class> tripping characteristics; heaters and sensors in each phase, matched to nameplate full-load current of actual protected motor and having appropriate adjustment for duty cycle; external reset push button[; bimetallic type] [; melting alloy type].
5. [Flush] [Surface] mounting.
6. [Red] [Green] pilot light.
7. Additional Nameplates: [FORWARD and REVERSE for reversing controllers] [HIGH and LOW for two-speed controllers] <Insert special markings>.
8. [N.O.] [N.C.] auxiliary contact.

E. Magnetic Controllers: Full voltage, across the line, electrically held.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
c. Rockwell Automation, Inc.; Allen-Bradley brand.
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric.

2. Configuration: [Nonreversing] [Reversing].
3. Contactor Coils: Pressure-encapsulated type[with coil transient suppressors].

a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: [24] [120] <Insert value>-V ac; obtained from [integral CPT, with primary and secondary fuses] <Insert source of control power>, with [CPT] [control power source] of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

    a. CPT Spare Capacity: [50] [100] [200] <Insert number> VA.

6. Melting Alloy Overload Relays:

    a. Inverse-time-current characteristic.
    b. [Class 10] [Class 20] [Class 30] tripping characteristic.
    c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

7. Bimetallic Overload Relays:

    a. Inverse-time-current characteristic.
    b. [Class 10] [Class 20] [Class 30] tripping characteristic.
    c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
    d. Ambient compensated.
    e. Automatic resetting.

8. Solid-State Overload Relay:

    a. Switch or dial selectable for motor running overload protection.
    b. Sensors in each phase.
    c. [Class 10] [Class 20] [Class 10/20 selectable] tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
    d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
    e. Analog communication module.

9. [N.C.] [N.O.], isolated overload alarm contact.
10. External overload reset push button.

F. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Rockwell Automation, Inc.; Allen-Bradley brand.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric.

2. Fusible Disconnecting Means:

    a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate [Class J] [Class R] [indicated] fuses.
    b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

3. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.
4. Nonfusible Disconnecting Means:

    a. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
    b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
    c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

5. MCP Disconnecting Means:

    a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
    b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
    c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
    d. [N.C.] [N.O.] alarm contact that operates only when MCP has tripped.
    e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

6. MCCB Disconnecting Means:

    a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
    b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
    c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
    d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
    e. [N.C.] [N.O.] alarm contact that operates only when MCCB has tripped

2.2 MULTISPEED MAGNETIC CONTROLLERS

A. General Requirements for Multispeed Magnetic Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Multispeed Magnetic Controllers: Two speed, full voltage, across the line, electrically held.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Rockwell Automation, Inc.; Allen-Bradley brand.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric.

2. Configuration: [Nonreversing] [Reversing]; [consequent pole] [two winding].
3. Contactor Coils: Pressure-encapsulated type[with coil transient suppressors].

    a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: [24] [120] <Insert value>-V ac; obtained from [integral CPT, with primary and secondary fuses] <Insert source of control power>, with [CPT] [control power source] of

sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

a. CPT Spare Capacity: [50] [100] [200] <Insert number> VA.

6. Compelling relays shall ensure that motor will start only at low speed.
7. Accelerating timer relays shall ensure properly timed acceleration through speeds lower than that selected.
8. Decelerating timer relays shall ensure automatically timed deceleration through each speed.
9. Antiplugging timer relays shall ensure a time delay when transferring from FORWARD to REVERSE and back.
10. Melting Alloy Overload Relays:

    a. Inverse-time-current characteristic.
    b. [Class 10] [Class 20] [Class 30] tripping characteristic.
    c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

11. Bimetallic Overload Relays:

    a. Inverse-time-current characteristic.
    b. [Class 10] [Class 20] [Class 30] tripping characteristic.
    c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
    d. Ambient compensated.
    e. Automatic resetting.

12. Solid-State Overload Relay:

    a. Switch or dial selectable for motor running overload protection.
    b. Sensors in each phase.
    c. [Class 10] [Class 20] [Class 10/20 selectable] tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
    d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
    e. Analog communication module.

13. [N.C.] [N.O.], isolated overload alarm contact.
14. External overload reset push button.

C. Combination Multispeed Magnetic Controller: Factory-assembled combination of reduced-voltage magnetic controller, OCPD, and disconnecting means.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Rockwell Automation, Inc.; Allen-Bradley brand.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric.

2. Fusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate [Class J] [Class R] [indicated] fuses.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

3. Nonfusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

4. MCP Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
d. [N.C.] [N.O.] alarm contact that operates only when MCP has tripped.
e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

5. MCCB Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
e. [N.C.] [N.O.] alarm contact that operates only when MCCB has tripped.

2.3 ENCLOSURES

A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: [Type 1] <Insert type>.
2. Outdoor Locations: [Type 3R] [Type 4X] <Insert type>.
3. [Kitchen] [Wash-Down] Areas: [Type 4X] <Insert type>, [stainless steel] <Insert material>.
4. Other Wet or Damp Indoor Locations: [Type 4] <Insert type>.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.
6. Hazardous Areas Indicated on Drawings: [Type 7] [Type 9] <Insert type>.

2.4 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: [Heavy] [Standard]-duty, [oiltight] type.

a. Push Buttons: [Covered] [Lockable] [Recessed] [Shielded] [Shrouded] [Unguarded] types; [maintained] [momentary] as indicated.
b. Pilot Lights: [Incandescent] [LED] [Neon] [Resistor] [Transformer] types; colors as indicated[; push to test].
c. Selector Switches: [Rotary] <Insert description> type.

2. Elapsed Time Meters: Heavy duty with digital readout in hours[; nonresettable] [; resettable].
3. Meters: Panel type, 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale and plus or minus two percent accuracy. Where indicated, provide selector switches with an off position.

B. [N.C.] [N.O.] [Reversible N.C./N.O.] auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable [pneumatic] [solid-state] time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

E. Breather and drain assemblies, to maintain interior pressure and release condensation in [Type 4] [Type 4X] [Type 7] [Type 9] <Insert type> enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

F. Space heaters, with N.C. auxiliary contacts, to mitigate condensation in [Type 3R] [Type 4X] [Type 12] <Insert type> enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

G. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

H. Cover gaskets for Type 1 enclosures.

I. Terminals for connecting power factor correction capacitors to the [line] [load] side of overload relays.

J. Spare control wiring terminal blocks, quantity as indicated[; unwired] [; wired].

K. <Insert accessories>.

PART 3 - EXECUTION

3.1 NOTE REGARDING INSTALLATION OF FIRE ALARM, FIRE PROTECTION, HVAC, PLUMBING AND ELECTRICAL DEVICES:

A. The Architect’s intention is to align and/or center wall-mounted devices, typically, and ceiling-mounted devices as well, whether those devices are provided by the electrician, plumber, sprinkler installer, mechanical sub-contractor, or others. For walls, these devices and their alignments may be indicated on interior elevations or building sections, but, regardless, it is expected that adjustments may need to be made in the field, or that additional items may be required. The installation of all such items shall be as reviewed and approved by the Architect. The devices to be aligned and/or centered may include sconces, switches, thermostats and electrical outlets, where located close to one another, and may also include wall diffusers, side-mounted sprinkler heads, return grilles, access panels, pull stations, horns and strobes, etc.

B. In ceilings, the Architect’s intention is to center ceiling-mounted elements within a space or a room, and/or to align them with one another. These devices and their alignments may be indicated on the reflected ceiling plans, but it is expected that adjustments may need to be made in the field, or that additional items may be required to be mounted. The installation of all such items shall be as reviewed and approved by the Architect. The devices to be aligned and/or centered may include lights, HVAC equipment, access panels, diffusers and returns, sprinkler heads, paddle fans, ceiling lights, exhaust fans, smoke detectors, etc. If the ceiling is of a modular type (panels), it is expected that device locations will also be coordinated and aligned and/or centered within the panels.

C. The General Contractor shall coordinate the various trades involved in providing and installing such wall- and ceiling-mounted devices before any installation begins, in accordance with the requirement for a preliminary coordination meeting called for elsewhere in these specifications. The General Contractor shall review approaches to locating devices, and specific device locations, with the Architect before roughing. Roughed items that do not comply with the intentions of this section, or with the architectural drawings, shall be relocated per the Architect's direction. Additional payment will not be made for the cost of relocating elements that were not installed in accordance with these intentions or with the Architect's approval, or for the cost of patching of finishes that might be necessary by such relocation.

3.2 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

B. Floor-Mounted Controllers: Install enclosed controllers on 4-inch (100-mm) nominal-thickness concrete base. Comply with requirements for concrete base specified in [Section 033000 "Cast-in-Place Concrete."] [Section 033053 "Miscellaneous Cast-in-Place Concrete."]

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Seismic Bracing: Comply with requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in each fusible-switch enclosed controller.

F. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."

G. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

H. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

I. Install power factor correction capacitors. Connect to the [line] [load] side of overload relays. If connected to the load side of overload relays, adjust overload heater sizes to accommodate the reduced motor full-load currents.

J. Comply with NECA 1.

3.4 IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.5 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices[and facility's central control system]. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: [Owner will engage] [Engage] a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation.[Test and adjust controllers, components, and equipment.]
2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify [Architect] [Construction Manager] [Owner] before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed controllers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify [Architect] [Construction Manager] [Owner] before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers at [50] [65] [80] percent.

E. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage solid-state controllers.

F. Set field-adjustable circuit-breaker trip ranges[as specified in Section 260573 "Overcurrent Protective Device Coordination Study."]

3.8 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.9 DEMONSTRATION

A. [Engage a factory-authorized service representative to train] [Train] Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers[, and to use and reprogram microprocessor-based, reduced-voltage solid-state controllers].

END OF SECTION

SECTION 26 5100

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.
5. Retrofit kits for fluorescent lighting fixtures.

B. Related Sections:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. [**Section 260933 "Central Dimming Controls"**] [**Section 260936 "Modular Dimming Controls"**] for architectural dimming systems.
3. Section 260943 "Network Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
4. Section 262726 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
5. Section 265561 "Theatrical Lighting" for theatrical lighting fixtures and their controls.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast, including BF.
4. Energy-efficiency data.
5. Air and Thermal Performance Data: For air-handling lighting fixtures. Furnish data required in "Action Submittals" Article in Section 233713 "Diffusers, Registers, and Grilles."
6. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Section 233713 "Diffusers, Registers, and Grilles."
7. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
8. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For each lighting fixture indicated in the Interior Lighting Fixture Schedule. Each Sample shall include the following:

1. Lamps and ballasts, installed.
2. Cords and plugs.
3. Pendant support system.

D. Installation instructions.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches (305 mm) of the plane of the luminaires.
4. Ceiling-mounted projectors.
5. Structural members to which suspension systems for lighting fixtures will be attached.
6. Other items in finished ceiling including the following:

    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.
    e. Occupancy sensors.
    f. Access panels.
    g. <**Insert item**>.

7. Perimeter moldings.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: [**10 for every 100**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses: [**One for every 100**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.
3. Fluorescent-fixture-mounted, emergency battery pack: One for every [**20**] [**50**] <**Insert number**> emergency lighting unit.
4. Ballasts: [**One for every 100**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.
5. Globes and Guards: [**One for every 20**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

F. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of fixtures for mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.10 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: [**10**] <**Insert number**> years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
2. Warranty Period for [**Emergency Fluorescent Ballast**] [**and**] [**Self-Powered Exit Sign**] Batteries: [**Seven**] <**Insert number**> years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, [**provide product indicated on Drawings**] [**provide one of the products indicated on Drawings**] [**available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings**].

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

E. Metal Parts: Free of burrs and sharp corners and edges.

F. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

H. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least [**0.125 inch (3.175 mm)**] <**Insert dimension**> minimum unless otherwise indicated.
b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

I. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.

c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
f. CCT and CRI for all luminaires.

J. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

K. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Section 233713 "Diffusers, Registers, and Grilles."

1. Air-Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
2. Heat-Removal Units: Air path leads through lamp cavity.
3. Combination Heat-Removal and Air-Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air-supply units.
4. Dampers: Operable from outside fixture for control of return-air volume.
5. Static Fixture: Air-supply slots are blanked off, and fixture appearance matches active units.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:

1. Comply with UL 935 and with ANSI C82.11.
2. Designed for type and quantity of lamps served.
3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
4. Sound Rating: [**Class A**] [**Class A except Class B for T12/HO and T12/Slimline lamp ballasts**].
5. Total Harmonic Distortion Rating: Less than [**10**] [**20**] percent.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Operating Frequency: [**42**] <**Insert value**> kHz or higher.
8. Lamp Current Crest Factor: [**1.7**] <**Insert value**> or less.
9. BF: [**0.88**] <**insert value**> or higher.
10. Power Factor: [**0.95**] [**0.98**] or higher.
11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electronic Programmed-Start Ballasts for [**T5**] [**T8**] [**T5HO**] [**T5 and T5HO**] Lamps: Comply with ANSI C82.11 and the following:

1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
2. Automatic lamp starting after lamp replacement.

D. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

1. Ballast Manufacturer Certification: Indicated by label.

E. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

F. Ballasts for Low-Temperature Environments:

1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: [**Electronic**] [**or**] [**electromagnetic**] type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Higher: Electromagnetic type designed for use with indicated lamp types.

G. Ballasts for Residential Applications: Fixtures designated as "Residential" may use low-power-factor electronic ballasts having a Class B sound rating and total harmonic distortion of approximately 30 percent.

H. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

I. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Dimming Range: 100 to [**5**] <**Insert number**> percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to [**20**] <**Insert number**> percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
4. Control: Coordinate wiring from ballast to control device to ensure that the ballast, controller, and connecting wiring are compatible.

J. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.

1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.

    a. High-Level Operation: 100 percent of rated lamp lumens.
    b. Low-Level Operation: 30 percent of rated lamp lumens.

2. Ballast shall provide equal current to each lamp in each operating mode.
3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.

K. Ballasts for Tri-Level Controlled Lighting Fixtures: Electronic type.

1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.

    a. High-Level Operation: 100 percent of rated lamp lumens.
    b. Low-Level Operation: [**30 and 50**] [**30 and 60**] percent of rated lamp lumens.

2. Ballast shall provide equal current to each lamp in each operating mode.
3. Compatibility: Certified by manufacturer for use with specific tri-level control system and lamp type indicated.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: Class A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher unless otherwise indicated.
9. Power Factor: [**0.95**] [**0.98**][**, except fixtures designated as "Residential" may use low-power-factor electronic ballasts**] or higher.
10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.

1. Emergency Connection: Operate [**one**] <**Insert number**> fluorescent lamp(s) continuously at an output of [**1100**] <**Insert value**> lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
2. Nightlight Connection: Operate one fluorescent lamp continuously.
3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
4. Battery: Sealed, maintenance-free, nickel-cadmium type.
5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
6. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from lighting fixture. Comply with UL 924.

1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.

2. Nightlight Connection: Operate one fluorescent lamp in a remote fixture continuously.
3. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Charger: Fully automatic, solid-state, constant-current type.
5. Housing: NEMA 250, Type 1 enclosure.
6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 BALLASTS FOR HID LAMPS

A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.
3. Rated Ambient Operating Temperature: 104 deg F (40 deg C).
4. Open-circuit operation that will not reduce average life.
5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:

1. Minimum Starting Temperature: Minus 20 deg F (Minus 29 deg C) for single-lamp ballasts.
2. Rated Ambient Operating Temperature: 130 deg F (54 deg C).
3. Lamp end-of-life detection and shutdown circuit.
4. Sound Rating: Class A.
5. Total Harmonic Distortion Rating: Less than [**20**] <**insert number**> percent.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Lamp Current Crest Factor: 1.5 or less.
8. Power Factor: 0.90 or higher.
9. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
10. Protection: Class P thermal cutout.
11. Bi-Level Dimming Ballast: Ballast circuit and leads provide for remote control of the light output of the associated fixture between high- and low-level and off.

    a. High-Level Operation: 100 percent of rated lamp lumens.
    b. Low-Level Operation: [**35**] [**50**] percent of rated lamp lumens.
    c. Compatibility: Certified by ballast manufacturer for use with specific bi-level control system and lamp type indicated. Certified by lamp manufacturer that ballast operating modes are free from negative effect on lamp life and color-rendering capability.

12. Continuous Dimming Ballast: Dimming range shall be from 100 to [**35**] <**Insert number**> percent of rated lamp lumens without flicker.

    a. Ballast Input Watts: Reduced to a maximum of [**50**] <**Insert number**> percent of normal at lowest dimming setting.

C. High-Pressure Sodium Ballasts: Electromagnetic type, with solid-state igniter/starter. Igniter/starter shall have an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.

1. Instant-Restrike Device: Integral with ballast, or solid-state potted module, factory installed within fixture and compatible with lamps, ballasts, and mogul sockets up to 150 W.
2. Minimum Starting Temperature: Minus 40 deg F (Minus 40 deg C).

2.7 QUARTZ LAMP LIGHTING CONTROLLER

A. General Requirements for Controllers: Factory installed by lighting fixture manufacturer. Comply with UL 1598.

B. Standby (Quartz Restrike): Automatically switches quartz lamp on when a HID lamp in the fixture is initially energized and during the HID lamp restrike period after brief power outages.

C. Connections: Designed for a single branch -circuit connection.

D. Switching Off: Automatically switches quartz lamp off when HID lamp strikes.

E. Switching Off: Automatically switches quartz lamp off when HID lamp reaches approximately 60 percent light output.

2.8 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

4. Master/Remote Sign Configurations:

a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in [**LED power supply**] [**ballast**] [**battery**] for power connection to remote unit.
b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

C. Self-Luminous Signs: Powered by tritium gas, with universal bracket for flush-ceiling, wall, or end mounting. Signs shall be guaranteed by manufacturer to maintain the minimum brightness requirements in UL 924 for [**10**] [**15**] [**20**] years.

D. Self-Luminous Signs: Using strontium oxide aluminate compound to store ambient light and release the stored energy when the light is removed. Provide with universal bracket for flush-ceiling, wall, or end mounting.

2.9 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of [**15**] <**Insert period**> minutes when power is restored after an outage.
8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.10 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature [**3500**] <**Insert value**> K, and average rated life 20,000 hours unless otherwise indicated.

B. T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature [**3500**] <**Insert value**> K, and average rated life of 20,000 hours unless otherwise indicated.

C. T5 rapid-start lamps, rated 28 W maximum, nominal length of 45.2 inches (1150 mm), 2900 initial lumens (minimum), CRI 85 (minimum), color temperature [**3000**] <**Insert value**> K, and average rated life of 20,000 hours unless otherwise indicated.

D. T5HO rapid-start, high-output lamps, rated 54 W maximum, nominal length of 45.2 inches (1150 mm), 5000 initial lumens (minimum), CRI 85 (minimum), color temperature [**4100**] <**Insert value**> K, and average rated life of 20,000 hours unless otherwise indicated.

E. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature [**3500**] <**Insert value**> K, average rated life of 10,000 hours at three hours operation per start[**, and suitable for use with dimming ballasts**] unless otherwise indicated.

1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 57 W: T4, triple tube, rated 4300 initial lumens (minimum).
7. 70 W: T4, triple tube, rated 5200 initial lumens (minimum).

2.11 HID LAMPS

A. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), color temperature [**1900**] <**Insert value**> K, and average rated life of 24,000 hours, minimum.

1. Dual-Arc Tube Lamps: Arranged so only one of two arc tubes is lighted at one time and, when power is restored after an outage, the cooler arc tube, with lower internal pressure, lights instantly, providing an immediate 8 to 15 percent of normal light output.

B. Metal-Halide Lamps: ANSI C78.43, with minimum CRI [**65**] <**Insert value**>, and color temperature [**4000**] <**Insert value**> K.

C. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature [**4000**] <**Insert value**> K.

D. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI [**80**] <**Insert value**>, and color temperature [**4000**] <**Insert value**> K.

E. Low-Pressure Sodium Lamps: ANSI 78.41, CRI 0, and color temperature 1800 K.

2.12 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, [**12 gage (2.68 mm)**] <**Insert size**>.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, [**12 gage (2.68 mm)**] <**Insert size**>.

F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.13 RETROFIT KITS FOR FLUORESCENT LIGHTING FIXTURES

A. Reflector Kit: UL 1598, Type I. Suitable for two- to four-lamp, surface-mounted or recessed lighting fixtures by improving reflectivity of fixture surfaces.

B. Ballast and Lamp Change Kit: UL 1598, Type II. Suitable for changing existing ballast, lamps, and sockets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires[**, independent of the ceiling suspension devices,**] for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

E. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within [**12**] <**Insert number**> months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to [**two**] <**Insert number**> visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION

SECTION 26 5561
THEATRICAL LIGHTING AND CONTROL SYSTEMS

PART 1 – GENERAL

1.1 WORK INCLUDED:

A. One complete Auditorium Theatrical Lighting and Control System.

1.2 RELATED WORK:

A. Division 26 – Electrical

B. Section 27 05 53 – Identification for Communications Systems

1.3 GENERAL OPERATION AND DESCRIPTION:

A. General:

1. The Contractor acknowledges and warrants that they have closely examined all the Contract Documents, that they are suitable and sufficient to enable the Contractor to complete the Work in the time allotted for the Contract Sum as accepted by the Owner and Consultant, and that they include all Work, whether or not shown or described, which reasonably may be inferred to be required or useful for the completion of the Work in full compliance with all applicable codes, laws, ordinances, rules, and regulations.
2. Design, engineer and provide complete means of support, suspension, attachment, fastening, bracing, and seismic restraints of the work of this section including existing and new installed equipment in accordance with local building codes and regulations. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction.
3. All conduit, back-boxes, and wiring for electrical are to be supplied and installed by a licensed electrical contractor.
4. Provide all cable and wire associated with this specification section and related documents.
5. All systems shall be completely installed with all of the necessary interconnection, power supplies, patch cords, snakes, portable equipment cables and wiring to provide a fully functioning system. The governing overall requirement for this project is a complete and functional system. Include work not usually shown or specified but necessary for proper installation and operation of the system or piece of equipment.
6. Execution of the Contract by the Contractor is a representation and warranty that the Contractor has carefully examined the Contract Documents, and represents and warrants that the Contractor is thoroughly familiar with the nature and location of the Work, the Site, the specific conditions under which the Work is to be performed, and all matters which may in any way affect the Work or its performance. The Contractor further represents that as a result of such examinations and investigations, the Contractor has thoroughly reviewed and understands the Contract Documents and their Intent and purpose, and is familiar with all applicable codes, ordinances, laws, regulations and rules as they apply to the Work, and that the Contractor will abide by same.
7. Claims for additional time or additional compensation as a result of the Contractor's failure to follow the foregoing procedure and to familiarize itself with all local conditions and the Contract Documents will not be permitted.
8. The term “provide” shall be defined as: designed, engineered, furnished, installed, certified and tested by the Integrator/Contractor.
9. Loose equipment or products supplied but not installed shall be turned-over to the Owner immediately upon delivery. Contractor is to supply a signed statement of transfer of this equipment to the consultant for record. Client must sign this statement acknowledging receipt of this equipment.
10. The Lighting Contractor shall provide all wire and cable associated with this specification.
11. Where backing is required for the mounting of equipment, the Lighting Integrator shall coordinate with the General contractor and Owner to insure backing is present and in appropriate locations.

12. The Lighting Integrator shall perform all required control system configuration, programming, software, software set-up, calibration and re-calibration to provide a complete working system in accordance to the project specifications and Owner requirements. All Set up and adjustment of specified hardware and software.

B. System Description:
1. The system shall utilize a rack mount controller without a physical control surface. Programing shall be via wireless iPad app. Operation and control shall be via iPad and pre-programmed scene selection wall plate.
2. One FOH fixture shall be provided with a custom gobo with the school's logo. Coordinate with the school to obtain the desired image/graphics.
3. FOH lighting bar zooming dimmable RGBW fixtures shall be provided.
4. Stage overhead dimmable RGBAW batten lights shall be provided.

1.4 QUALITY ASSURANCE:

A. Source Quality Control: Materials and equipment shall be new, unused and U.L. listed.

B. The system and components shall be supplied by manufacturers of established reputation and experience who shall have produced similar apparatus for a period of at least ten (10) years and who shall be able to refer to similar installations rendering satisfactory service.

C. The Lighting Systems shall be installed by the manufacturers' authorized distributor and installation contractor for the specified system, hereinafter known as the "Lighting System Trade." The installation shall include wiring, components, connections, adjustment, testing and certification. The Electrical Trade shall provide conduit, junction boxes and pull boxes as indicated and required by the Lighting System manufacturer's drawings or Trade instructions. The Lighting Trade shall furnish any special boxes, cabinets, enclosures and similar items to the Electrical Trade for installation by the Electrical Trade in accordance with the manufacturers' drawings, Trade instructions, and as indicated. The Public Address System Trade shall be NICET certified and shall have computer-aided acoustical analysis capabilities.

D. The Lighting System Trade shall furnish a list of similar or equal installations (a minimum of ten) and show at least twenty (20) years of company experience in this type of work.

1.5 REFERENCES:

A. The complete installation, including additions and modifications, shall be in accordance with:
1. National Electrical Code Article 760 & 800.
2. Minimum standards of Electronics Industries Association (EIA).

1.6 SUBMITTALS:

A. Submit shop drawings, analysis and product data in accordance with Section 27 05 00.
1. Shop Drawings the Lighting System manufacturer and Trade shall provide:
a. A one-line riser diagram indicating route and conduit size, external wiring and connections of system proposed.
b. Furnish complete operating instructions, including schematic and wiring diagrams of the system, engineering data sheets on each component and complete servicing data including part numbers of the various components.
c. The first sheet inside the submittal shall be a complete equipment list indicating the specific quantities to be furnished. The data sheet for each module of the system shall be listed net to the quantities. This information shall be furnished in the front of the submittal.
d. A specific description of the system shall be furnished describing each module and how it shall function in the system.
e. A specific drawing shall be made by the equipment supplier of the equipment rack. Each module shall be shown in its proper location with its terminal designations shown.
f. A data sheet shall be furnished for each module and device. The information shall be high-lighted or underlined, that applies to the particular module or device to be furnished.

g. A detailed diagram showing how to connect each device shall be furnished indicating exact final connection information.

a) Product Data: Submit application, technical, and installation data.

h. Submit Operation and Maintenance Manuals in accordance with Section 27 05 00.

1.7 WARRANTY, SERVICES:

A. The Lighting System manufacturer and Trade shall warrant the Lighting System for a minimum of one year from date of acceptance by Owner against defective parts and/or workmanship and shall provide parts and labor to fulfill this warranty at no cost to Owner.

B. Refer to Section 27 05 00 for submission of warranty.

C. Qualified service and parts shall be available to call on within a 150 mile basis.

D. The Lighting System Trade shall include in his quotation the cost of three (3) inspections of the system during the two (2) years subsequent to the installation. The Trade installing this equipment shall be prepared to offer the Owner a service contract after the guarantee period has ended. On-the-premises service furnished at other than normal working hours shall also be available and shall be charged at current labor rates. Sub-letting of this service shall disqualify the bidder.

PART 2 - PRODUCTS [S] [O/M]

2.1 GENERAL:

A. Materials and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as components of the specified systems.

B. Where a particular material, device, piece of equipment or system is specified directly, the current manufacturer's specification for the same shall be considered to be a part of these specifications, as if completely contained herein in every detail.

C. All materials and products will be new and of professional quality. Unless specifically stated in the drawings or specifications, no existing or used materials will be installed.

D. Provide the quantity of products as shown on the Contract Drawings, or as otherwise indicated herein.

E. The equipment listed in section 2.02 consists of all major equipment for the project. The Contractor will integrate these into the system design and provide any additional components, wiring, programming, etc., to complete a functional system operating as described within the specifications and the category Lighting drawings.

F. Components or equipment not specified or indicated on the drawings that are required to make a fully functional systems per the Owner's requirements and the design intent, shall be furnished and installed by the Contractor, and shall be submitted for Owner review.

2.2 MATERIALS AND EQUIPMENT:

Qty	Item	Manufacturer	Notes
1	OVATIONE260CW	Chauvet	GOBO ELIPSOIDAL ENGIN
1	OHDLENS26	Chauvet	ELOPSOIDAL 26 DEGREE LENS
1	OVBGOBOGLASS	Chauvet	GOBO HOLDER
1	OBVGOBOMETAL	Chauvet	GOBO HOLDER
8	COLORADO2SOLO	Chauvet	FOH Light Bar Fixtures
8	COLORADOSOLOBATTEN4	Chauvet	Stage Overhead Down Lighting
17	SC08	Chauvet	Safety Cables
17	CLP05	Chauvet	Fixture C-Clamp
6	DMX5P5FT	Chauvet	5 Foot DMX Cable
8	DMX5P10FT	Chauvet	10 Foot DMX Cable

6	DMX5P25FT	Chauvet	25 Foot DMX Cable
1	DATASTREAM4	Chauvet	DMX 4x Splitter
1	QuickQ Rack	ChamSys	Rack Mount Lighting Controller
1	GeNetix 10Scene Wall Plate	ChamSys	Lighting Scene Preste Wall Plate
1	GeNetix 10Scene Gateway	ChamSys	Wall Plate Intface
1	ipad with Lighting Software	ChamSys	Lighting Control Software, Interfaced for QuickQ Rack
1	Custom GOBO with School Logo	Chauvet	

PART 3 - EXECUTION

3.1 INSPECTION:

A. The Lighting System Trade shall be responsible for all arrange-ments for testing and approval of the System before the System is accepted by the Owner and Architect/Engineer.

3.2 INSTALLATION:

A. General: Provide all wire, conduit, outlets and equipment as on the drawings and as specified here-in for a complete public address system. All material and/or equipment necessary for the proper operation of the system, even though not specifically mentioned in the Contract Documents, shall be deemed part of this Contract. All equipment shall be installed and connected in strict accordance with the manufacturer's recommended instructions. So as to provide for matched systems for service maintenance from one source, all equipment shall be furnished by one equipment supplier.

B. Wiring:

1. Complete Conduit Raceway System Option:
    a. All wiring methods shall be in accordance with NFPA-70, Article 800, and all other codes specified herein. Provide proper number, size of wires and conduit as required for operation of the system in accordance with the manufacturer's instructions. Boxes and conduit shall be provided by Division 26.
        a) Wiring Methods: All wiring shall be in conduit systems.
            (a) No wiring other than that directly associated with Lighting systems shall be permitted in this system's conduits.
            (b) Wiring splices are to be avoided to the extent possible, and if needed they must be made only in junction boxes and shall be crimp connected.
            (c) Transposing or changing color coding of wires shall not be permitted.
            (d) Wire nut-type connections are not acceptable.
            (e) All conductors shall be labeled on each end with "E-Z markers" or equivalent.
            (f) Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its termination.
            (g) Cabinet terminals shall be numbered and coded. All controls, function switches, etc., shall be clearly labeled on all equipment panels.
            (h) All connections to panels, devices and equipment shall be made with crimp type terminal connections, or resin core solder method approved by manufacturer.
            (i) All wiring shall be checked and tested to insure that there are no grounds, opens or shorts.
2. All boxes, conduits, etc., shall be of proper size, shall be clearly marked for easy identifi-cation and continuously bonded together and grounded to the Building Grounding Electrode System (BGES).

3. All equipment except portable equipment shall be firmly held in place. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three.
4. The Lighting System Trade shall take such precautions as are necessary to prevent and guard against E.M.I., to supply adequate ventilation, and to install the equipment so as to provide reasonable safety for the operator.
5. The actual circuit routing of the Lighting System shall be by the installing trade based on the location of the devices, circuit limitations and wire limitations.
6. Exact fixture location, aiming and adjustments shall be performed in the field. Fixture locations shall be coordinated with ductwork, house lighting, fire protection system piping, etc. as required.

3.3 TECHNICAL ASSISTANCE:

A. Instruction: The installation supervising technician for the Lighting System Trade shall instruct the proper designated authority on the correct operation of the system after the installation is completed. This instruction shall consist of:
   1. Two hours of technical service training to the Owner's technical staff using the factory operation manuals previously specified.
   2. All training specified herein shall be performed by a factory certified technician.

3.4 FIELD QUALITY CONTROL:

A. Upon completion of the installation, the Lighting System Trade's factory-trained technician shall perform all necessary electrical tests and adjustments and who shall then submit a Letter of Certification to the Owner/Architect/Engineer that the system functions and conforms to all requirements of the manufacturer of the equipment, these specifications, and all requirements of Uniform Statewide Building Code for type of building in which the system is installed.

B. Final systems quality and performance, testing, calibrating and overall commissioning shall be performed by the installer prior to the commencement of owner training. Installer shall furnish all labor, instruments, equipment, temporary power, and materials necessary to perform the system tests outline below at no additional cost. The system shall be fully tested and operational before final inspection.

C. Test that all circuits and wiring are free of shorts and grounds and that all wiring has been terminated in the properly.

D. Aim, focus and adjust each fixture physically and via the control system.

E. Coordinate with the owner to create scenes and presets for common uses of the system.

F. Program the scene recall wall plate.

G. Load and test the system control software on the Lighting designated iPad.

H. The factory trained technician shall perform all electrical and mech-anical tests, measurements and adjustments required. All test costs shall be in the Contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate. The report shall include, but not be limited to:
   1. A complete list of equipment installed and wired.
   2. Indication that all equipment is properly installed and functions and conforms with these specifications.
   3. After completion of all tests, measurements and adjustments listed above, the Lighting System Trade shall submit the following information to the Architect/Engineer.
      a. "As-built" conduit layout diagrams including wire color code and/or tag number.
      b. Complete "as-built" wiring diagrams.
      c. Complete operating instructions, including engineering data sheets on each major component and complete servicing data including part numbers of the various components.

4. The completed Lighting System shall be tested to insure that it is operating properly. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any problems. Should a problem occur, the Lighting System Trade shall readjust or replace the defective components and begin another ninety (90) day test period. This test shall not start until the Owner has obtained beneficial use of the building under tests.

END OF SECTION

SECTION 26 5600

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior luminaires with lamps and ballasts.
2. Luminaire-mounted photoelectric relays.
3. Poles and accessories.
4. Luminaire lowering devices.

B. Related Sections:

1. Section 265100 "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. HID: High-intensity discharge.

D. LER: Luminaire efficacy rating.

E. Luminaire: Complete lighting fixture, including ballast housing if provided.

F. Pole: Luminaire support structure, including tower used for large area illumination.

G. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf (2224 N), distributed as stated in AASHTO LTS-4-M.

C. Ice Load: Load of 3 lbf/sq. ft. (145 Pa), applied as stated in AASHTO LTS-4-M Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.

1. Basic wind speed for calculating wind load for poles exceeding 49.2 feet (15 m) in height is [**100 mph (45 m/s)**] [**90 mph (40 m/s)**] <**Insert value from AASHTO LTS-4-M for this Project**> .

   a. Wind Importance Factor: [**1.0**] <**Insert value from Table 3-2**>.
   b. Minimum Design Life: [**50 years**] <**Insert value from Table 3-3**>.
   c. Velocity Conversion Factors: [**1.0**] <**Insert value from Table 3-2**>.

2. Basic wind speed for calculating wind load for poles 50 feet (15 m) high or less is [**100 mph (45 m/s)**] [**90 mph (40 m/s)**] <**Insert value from AASHTO LTS-4-M for this Project**>.

   a. Wind Importance Factor: [**1.0**] <**Insert value from Table 3-2**>.
   b. Minimum Design Life: [**25 years**] <**Insert value from Table 3-3**>.
   c. Velocity Conversion Factors: [**1.0**] <**Insert value from Table 3-2**>.

1.5 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.

   a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
   b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Photoelectric relays.
7. Ballasts, including energy-efficiency data.
8. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
9. Materials, dimensions, and finishes of poles.
10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
11. Anchor bolts for poles.
12. Manufactured pole foundations.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
3. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
4. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include lamps and ballasts.

1.6 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For [**luminaires**][**and poles**] [**luminaire lowering devices**] to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: [**One for every 100**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.
2. Glass and Plastic Lenses, Covers, and Other Optical Parts: [**One for every 100**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.
3. Ballasts: [**One for every 100**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: [**One for every 20**] <**Insert quantity**> of each type and rating installed. Furnish at least one of each type.

1.9 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with IEEE C2, "National Electrical Safety Code."

E. Comply with NFPA 70.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch (6 mm) deep. Do not apply tools to section of pole to be installed below ground line.

D. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

E. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: [**Five**] <**Insert number**> years from date of Substantial Completion.
2. Warranty Period for Metal Corrosion: [**Five**] <**Insert number**> years from date of Substantial Completion.
3. Warranty Period for Color Retention: [**Five**] <**Insert number**> years from date of Substantial Completion.
4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than [**three**] <**Insert number**> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, [**provide product indicated on Drawings**] [**provide one of the products indicated on Drawings**] [**available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings**].

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: As selected from manufacturer's standard catalog of colors.
    b. Color: Match Architect's sample of [**manufacturer's standard**] [**custom**] color.
    c. Color: As selected by Architect from manufacturer's full range.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

    a. Color: [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**].

O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

    a. "USES ONLY" and include specific lamp type.
    b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
    c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
    d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
    e. ANSI ballast type (M98, M57, etc.) for HID luminaires.

f. CCT and CRI for all luminaires.

2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay.[**Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.**]

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.4 FLUORESCENT BALLASTS AND LAMPS

A. Ballasts for Low-Temperature Environments:

1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: [**Electronic**] [**or**] [**electromagnetic**] type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Higher: Electromagnetic type designed for use with indicated lamp types.

B. Ballast Characteristics:

1. Power Factor: 90 percent, minimum.
2. Sound Rating: [**Class A**] [**Class A except Class B for T12/HO ballasts**].
3. Total Harmonic Distortion Rating: Less than [**10**] [**20**] percent.
4. Electromagnetic Ballasts: Comply with ANSI C82.1, energy-saving, high power factor, Class P, automatic-reset thermal protection.
5. Case Temperature for Compact Lamp Ballasts: 65 deg C, maximum.
6. Transient-Voltage Protection: Comply with IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

C. Low-Temperature Lamp Capability: Rated for reliable starting and operation with ballast provided at temperatures [**0 deg F (minus 18 deg C)**] [**minus 20 deg F (minus 29 deg C)**] and higher.

2.5 BALLASTS FOR HID LAMPS

A. Comply with ANSI C82.4 and UL 1029 and capable of open-circuit operation without reduction of average lamp life. Include the following features unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C).
3. Normal Ambient Operating Temperature: 104 deg F (40 deg C).
4. Ballast Fuses: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by ballast manufacturer.

B. Auxiliary, Instant-On, Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent of light output.

C. High-Pressure Sodium Ballasts: Electromagnetic type with solid-state igniter/starter and capable of open-circuit operation without reduction of average lamp life. Igniter/starter shall have an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.

1. Instant-Restrike Device: Integral with ballast, or solid-state potted module, factory installed within fixture and compatible with lamps, ballasts, and mogul sockets up to 150 W.

a. Restrike Range: 105- to 130-V ac.
b. Maximum Voltage: 250-V peak or 150-V ac rms.

2. Minimum Starting Temperature: Minus 40 deg F (Minus 40 deg C).

2.6 HID LAMPS

A. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), CCT color temperature [**1900**] <**Insert value**> K, and average rated life of 24,000 hours, minimum.

1. Dual-Arc Tube Lamp: Arranged so only one of two arc tubes is lighted at one time and, when power is restored after an outage, the cooler arc tube, with lower internal pressure, lights instantly, providing an immediate 8 to 15 percent of normal light output.

B. Low-Pressure Sodium Lamps: ANSI C78.43.

C. Metal-Halide Lamps: ANSI C78.43, with minimum CRI [**65**] <**Insert value**>, and CCT color temperature [**4000**] <**Insert value**> K.

D. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and CCT color temperature [**4000**] <**Insert value**> K.

E. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI [**80**] <**Insert value**>, and CCT color temperature [**4000**] <**Insert value**> K.

2.7 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of [**1.1**] <**Insert number**> to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.[**Provide on all, except wood poles.**]

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

2.8 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in height with access handhole in pole wall.

1. Shape: [**Round, tapered**] [**Round, straight**] [**Square, tapered**] [**Square, straight**].
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Steel Mast Arms: [**Single-arm**] [**Truss**] [**Davit**] type, continuously welded to pole attachment plate. Material and finish same as pole.

C. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with [**stainless**] [**galvanized**]-steel bolts.
2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch (381-mm) vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet (3 m) above finished grade.

F. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch (76-by-127-mm) handhole located at midpoint of pole with cover for access to internal welded attachment lug for electric cable support grip.

G. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

I. Platform for Lamp and Ballast Servicing: Factory fabricated of steel with finish matching that of pole.

J. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

K. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.

L. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."
2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**].

2.9 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429/B 429M, Alloy 6063-T6 with access handhole in pole wall.

B. Poles: ASTM B 209 (ASTM B 209M), 5052-H34 marine sheet alloy with access handhole in pole wall.

1. Shape: [**Round, tapered**] [**Round, straight**] [**Square, tapered**] [**Square, straight**].
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.

1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.

2. Finish: Same as [**pole**] [**luminaire**].

F. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

G. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
5. <**Insert finish**>.

    a. Color: [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**] [**As selected by Architect from manufacturer's full range**].

2.10 FIBERGLASS POLES

A. Poles: Designed specifically for supporting luminaires, with factory-formed cable entrance and handhole. Not less than 65 percent fiberglass, with resin and pigment making up the remainder.

1. Resin Color: [**Dark bronze**] <**Insert color**>; provide uniform coloration throughout entire wall thickness.
2. Surface Finish: Pigmented polyurethane, with a minimum dry film thickness of 1.5 mils (0.04 mm). Polyurethane may be omitted if the surface layer of pole is inherently UV inhibited.

2.11 DECORATIVE POLES

A. Pole Material:

1. Cast ductile iron.
2. Cast gray iron, according to ASTM A 48/A 48M, Class 30.
3. Cast aluminum.
4. Cast concrete.
5. Spun concrete.
6. Steel tube, covered with closed-cell polyurethane foam, with a polyethylene exterior.
7. <**Insert material**>.

B. Mounting Provisions:

1. Bolted to concrete foundation.
2. Embedded.

C. Fixture Brackets:

1. Cast ductile iron.
2. Cast gray iron.
3. Cast aluminum.

D. Pole Finish: <**Insert finish**>.

2.12 LAMINATED WOOD POLES

A. Species and Grades for Structural Glulam Timber: Engineer and fabricate structural laminated wood poles, complying with ANSI A190.1. Use [**southern pine**] [**Douglas fir**] [**Alaska cedar**] [**any species listed in AITC 117**] to withstand indicated structural loads without exceeding allowable design working stresses according to AITC 117.

B. Features: Include [**wood bracket**] [**wood crossarm**] [**pole-top adapter**] <**Insert items**> for mounting luminaire(s), [**metal pole cap,**]and concealed raceway path connected to access handhole.

C. Mounting Provisions: [**Embedded**] <**Insert description of other mounting, unless detailed on Drawings**>.

D. Appearance Grade: Architectural appearance grade complying with AITC 110.

E. Preservative Treatment: Pressure treat lumber before gluing according to AWPA C28 for waterborne preservatives. After dressing and end-cutting each member to final size and shape, apply a field-treatment preservative to comply with AWPA M4 to surfaces cut to a depth of more than 1/16 inch (1.6 mm).

F. Adhesive: Wet-use type complying with ASTM D 2559.

G. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

H. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

I. Finish: [**Natural, unstained wood**] [**Semitransparent stain applied after erection**] [**Semitransparent stain applied at factory**], color as selected by Architect.

2.13 WOOD POLES

A. Poles: [**Douglas fir**] [**Southern yellow pine**], [**machine trimmed by turning,**]complying with ANSI O5.1 and with AWPA C4 for wood species used; and bored, roofed, and gained before treatment.

1. Mounting Provisions: Embedded.

B. Preservative Treatment: Pressure treat poles with [**creosote**] [**pentachlorophenol**] [**ammoniacal copper arsenate**] according to AWPA C1 and AWPA C4.

C. Luminaire Brackets: Comply with ANSI C136.13.

2.14 PRESTRESSED CONCRETE POLES

A. Poles: Manufactured [**by centrifugal spin-casting process**] [**of cast concrete**].

1. Shape: [**Round, tapered**] [**Round, straight**] [**Square, tapered**] [**Square, straight**].
2. Mounting Provisions: [**Steel butt flange for bolted mounting to foundation or breakaway support**] [**Embedded**].
3. Finishing: Capped at top and plugged at bottom. Seat each steel reinforcing strand with epoxy adhesive.
4. Grounding: Continuous copper ground wire cast into pole. Terminate at top of pole[**and attach to 24-inch (610-mm) lightning rod**].

B. Cure with wet steam and age for a minimum of 15 days before installation.

C. Fabricate poles with a hard, nonporous surface that is resistant to water, frost, and road and soil chemicals and that has a maximum water-absorption rate of 3 percent.

D. Cast aluminum nameplate into pole wall at approximately 5 feet (1.5 m) above ground line, listing name of manufacturer, Project identifier, overall height, and approximate weight.

E. Pole Brackets: Comply with ANSI C136.13.

F. Finish Color: Provided by color material complying with ASTM C 979, uniformly impregnated throughout the pole concrete. Color material shall provide a uniform, stable, permanent <**Insert adjectives**> color and be as follows:

1. Inert, and carbon free.
2. Unaffected by environmental conditions and contaminants including, but not limited to, UV solar radiation, salts, and alkalis.

G. Finish Texture: [**Standard form**] [**Polished exposed aggregate**] [**Etched exposed aggregate**].

1. Exposed aggregate shall be of <**Insert aggregate type selected from manufacturers' lists**> type.

2.15 POLE ACCESSORIES

A. Duplex Receptacle: 120 V, 20 A in a weatherproof assembly complying with Section 262726 "Wiring Devices" for ground-fault circuit-interrupter type.

1. [**Surface mounted**] [**Recessed**], [**12 inches (300 mm)**] <**Insert dimension**> above finished grade.
2. Nonmetallic polycarbonate plastic or reinforced fiberglass, weatherproof in use, cover, <**Insert color to match pole,**> that when mounted results in NEMA 250, [**Type 3R**] [**Type 4X**] enclosure.
3. With cord opening.
4. With lockable hasp and latch that complies with OSHA lockout and tag-out requirements.

B. Minimum 1800-W transformer, protected by replaceable fuses, mounted behind access cover.

C. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

D. Transformer Type Base: Same material and color as pole. Coordinate dimensions to suit pole's base flange and accept [**ballast(s)**] [**indicated accessories**].

E. Decorative accessories, supplied by decorative pole manufacturer, include the following:

1. Banner Arms: <**Insert material**>.
2. Flag Holders: <**Insert material**>.
3. Ladder Rests: <**Insert material**>.

2.16 LOWERING SYSTEM FOR LUMINAIRES

A. Arrange system to lower luminaire[**assembly**] to a servicing position within 36 inches (900 mm) of finished grade in winds up to 30 mph (49 km/h) and to provide for manual plug connection to electrical power in the lowered position for testing.

B. Coordinate with luminaire and pole manufacturers for assembly details, wind-load and vibration analysis, and compatibility of materials for electrolysis-free attachment and connection for luminaire mounting assembly, lowering device, lowering cable, and portable winch.

C. Structural and Mechanical Design: Use a minimum safety factor of 5.0 for static and dynamic loads of load-bearing components, including cable.

D. Luminaire Mounting and Disconnect Arrangement: Multiple [**ring**] [**carriage**]-mounted luminaires, arranged for lowering and rising as a group.

1. Electrical cable for normal operating power to luminaires manually disconnects inside pole base, using weatherproof multipin connector, and shall be arranged to move within the pole during lowering and rising of luminaire assembly.
2. Electrical cable for normal operating power to luminaires automatically disconnects at a weatherproof multipin connector within the pole-top lowering head at the beginning of the lowering cycle and reconnects when luminaire or luminaire assembly is raised to the operating position.

E. Lowering Device: Weatherproof, cast-aluminum housing and multiple mechanical latches. Moving parts of latching assembly shall be located in the portion of the unit that is lowered to the servicing position. Positive latching in the operating position shall be indicated to the operator at the base of the pole by a clear visual signal, or by other means acceptable to Owner or authorities having jurisdiction.

F. Lowering Cable: [**Zinc-electroplated-**] [**or**] [**stainless-**]steel aircraft cable.

G. Portable Winch: [**Manual**] [**120-V electric**] type. [**One**] <**Insert number**> required.

1. Winch Power Connection: Cord and plug.
2. Winch Raise-Lower Control: Remote-control station with [**15 feet (5 m)**] <**Insert dimension**> of cable.

H. Winch Transformer: Portable, totally enclosed, encapsulated, single-phase, dry type. Primary rated at lighting-circuit voltage; secondary rated at 120 V. Permanent, primary and secondary, twist-locking plug connectors on pigtails shall match pole-base power outlet and winch plug.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming.[**Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.**]

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: [**60 inches (1520 mm)**] <**Insert dimension**>.
2. Water, Gas, Electric, Communication, and Sewer Lines: [**10 feet (3 m)**] <**Insert dimension**>.
3. Trees: [**15 feet (5 m)**] <**Insert dimension**> from tree trunk.
4. <**Insert features and clearance dimensions**>.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Dig holes large enough to permit use of tampers in the full depth of hole.
2. Backfill in 6-inch (150-mm) layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Make holes 6 inches (150 mm) in diameter larger than pole diameter.
2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi (20 MPa) at 28 days, and finish in a dome above finished grade.
3. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
4. Cure concrete a minimum of 72 hours before performing work on pole.

G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- (150-mm-) wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with [**pea gravel**] <**Insert material**> to a level 1 inch (25 mm) below top of concrete slab.

H. Raise and set poles using web fabric slings (not chain or cable).

3.3 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

B. Install on concrete base with top [**4 inches (100 mm)**] <**Insert dimension**> above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.4 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top [**4 inches (100 mm)**] <**Insert dimension**> above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.5 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.6 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

3.7 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):

a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting Installations."
b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
d. IESNA LM-64, "Photometric Measurements of Parking Areas."
e. IESNA LM-72, "Directional Positioning of Photometric Data."

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.8 DEMONSTRATION

A. [**Engage a factory-authorized service representative to train**] [**Train**] Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices.

END OF SECTION

SECTION 27 0500
COMMON WORK RESULTS FOR COMMUNICATIONS

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 is intended to describe the basic materials and installation methods for electrical work; it applies in general to all Sections under DIVISION 27. All materials and equipment specified and/or shown on Drawings are new unless noted otherwise.

B. All new materials, equipment and systems shall be listed and labeled by a licensed nationally recognized testing laboratory as defined by OSHA and used for the specific purpose, environment or application for which it was tested and approved. No field modifications and/or noncompliant installation whatsoever shall be made to any materials, equipment and systems that would violate the listing and labeling.

C. This section includes the following:
   1. Communications equipment coordination and installation.
   2. Sleeves for raceways and cables.
   3. Sleeve seals.
   4. Grout.
   5. Fire-Rated Cable Pathways
   6. Common communications installation requirements.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. EPDM: Ethylene-propylene-diene terpolymer rubber.

G. NBR: Acrylonitrile-butadiene rubber.

1.4 REFERENCES

A. Provide work in accordance with all applicable international, state and local, codes, rules, regulations, and standards, including but not limited to, requirements of the following:
   1. Underwriters' Laboratories, Inc. (UL).
   2. National Electrical Manufacturer's Association (NEMA).
   3. National Electrical Contractors Association (NECA)
   4. The Institute of Electrical and Electronics Engineers, Inc. (IEEE)
   5. Applicable NFPA Codes and Standards
   6. American National Standards Institute (ANSI)

7. Code of Federal Regulations (CFR)
8. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual, Latest Edition
9. Telecommunication Industries Association/Electronic Industries Alliance / (TIA/EIA)

B. The following standards are referenced to establish a base level of quality and conformance with industry standards. These specifications and the contract drawings shall take precedence over any document listed below.
1. Lucent Systimax PDS, Fiber Installation Manual

C. Conflicts
1. Nothing stated or shown in Specifications or on Drawings is intended to conflict with the above standards and regulations. Should Contractor find any apparent conflict, it shall be his responsibility to notify Architect before any of the work in question is performed or material purchased.

1.5 SUBMITTALS

A. Provide Product List of factory fabricated items, in accordance with Section 016000 “Product Requirements”, including name of proposed manufacturer, for all products specified in various sections of Division 27.

B. Provide submittals in accordance with Section 013300 “Submittal Procedures” in sufficient detail to verify full compliance with the requirements of the Contract Documents.

C. Product Data: Provide for each type of factory-fabricated product indicated.

D. Submit testing reports.

1.6 WARRANTY AND CONTRACT CLOSEOUT

A. Comply with warranty and contract closeout requirements specified in Division 01, GENERAL REQUIREMENTS.

B. Provide Special Warranties and/or warranty service in accordance with Section 016000 “Product Requirements” where specified in the various sections of Division 27 and as indicated below.
1. Warranty - Communications cabling systems shall be guaranteed in writing against defects in workmanship and defective materials for a period of one (1) year after acceptance by the Owner. During this time, communications cabling systems shall be kept in proper operating condition at no additional cost to the Owner.
2. Service - Provide one (1) year service contract on all communications cabling system components and equipment. Contract shall be based on 8 hours service and preventative maintenance per month.
3. All associated hardware and labor shall have a manufacturer and/or supplier's warranty for a minimum period of fifteen (15) years from the date of acceptance by the Owner. This warranty must guarantee channel and link performance parameters that meet or exceed those specified in EIA/TIA 568-B.2-1 and offer an assurance for any application that is designed to operate on Category 6 UTP cable. This is to include the replacement of any defective components provided as part of this project at no cost to the Owner for either parts or labor.
a. Provide manufacturer’s certificates of supervision and startup service as specified in the various sections of Division 27.
b. Upon completion of work and tests, and at a time mutually agreed to by Contractor, Architect and Owner, operate all systems installed, in all parts, at Contractor's expense for sufficient length of time to demonstrate the mode of operation and definitely determine whether systems as a whole are in first class working condition. Defects and malfunctions that may develop during this period of operation shall be immediately corrected by Contractor at his own expense, and systems placed in first class working condition before being finally turned over to Owner.

c. Include information for all products specified in the operation and maintenance manual.

d. Provide electrical certificate(s) from electrical inspection agency - see Article titled "Inspections".

e. Provide manufacturer's certification and warranty of system operation - see Article titled "Tests".

1.7 QUALITY ASSURANCE

A. The specifications for certain products and alternative materials may appear in more than one section of Division 27. Work of Division 27 shall be coordinated for all sections of Division 27 to assure that where two or more items of any given product are furnished under Division 27 that they are of the same manufacturer and type and that alternative materials is consistent throughout the work of Division 27.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle all material and equipment in accordance with manufacturer's instructions and recommendations. Such instructions and recommendations are hereby made part of these specifications.

B. Deliver products and equipment properly labeled and tagged. Maintain products in original shipping containers and store in a dry area until ready for installation.

C. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.9 INSPECTIONS

A. Before starting any Work under this Contract, file for inspection with the agency approved by the AHJ. Upon completion of the work, furnish electrical certificates from said agency for all electrical equipment and systems installed or furnished and installed as part of the work.

B. Communications equipment or systems that are modified in the field shall be reinspected. Furnish a new electrical certificate covering such modifications.

1.10 COORDINATION

A. The communications systems are indicated on the Communications Drawings. Certain pertinent information and details required by the communications work appear on the Architectural, Structural and Mechanical Drawings. Become familiar with all drawings and incorporate all pertinent requirements

B. Drawings are diagrammatic and indicate general arrangement of systems and requirements of the Communications work. Do not scale the drawings to obtain dimensional requirements. Exact locations of equipment must be coordinated and obtained prior to starting the work.

C. Coordinate arrangement, mounting, and support of communications equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
    a. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
    b. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
    c. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

1.11 EQUIPMENT LOCATIONS

A. Locations are subject to changes in order to avoid obstacles in building construction. Verify all dimensions and conditions at site. Check layout for sizes and clearances, so that the apparatus and material may be installed and operated satisfactorily in space provided. Install equipment and raceways to preserve headroom and to keep openings and passageways clear.

B. Install equipment, boxes and outlets in accessible locations. Obtain final locations of all outlets and equipment from details on drawings and from Architect. Examine drawings of other trades and avoid interferences with their work.

C. In case of conflict in location of flush outlets, architectural details shall take precedence.

D. Install conduit to avoid mechanical and/or structural obstructions, minimizing crossovers.

E. Install all exposed conduits parallel or perpendicular to building lines.

F. Provide minimum of 6 inches clearance between communications work and electrical work, flues, steam pipes and other heat sources.

G. Mounting heights of outlets and equipment shall be as indicated on "Mounting Height" Schedule, or as specified herein.

H. Verify all door swings before installing switch boxes. In case of conflict between drawings, Architectural details shall take precedence.

I. Architect reserves the right to change, without additional cost, location of any communications outlet, provided such changed location is not more than 10 feet, and is ordered changed before said work is completely "roughed in".

J. Locations of communications equipment and connections to all other equipment are approximately correct, and are subject to such modifications as are required at time of installation, in order to meet field conditions or the dimensions of equipment actually being supplied.

K. No changes are to be made in the original design without written approval by Architect.

PART 2 - PRODUCTS

2.1 SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.
   1. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
      b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
   1. Manufacturers: Subject to compliance with requirements,
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product name or designation or comparable product by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Metraflex Co.

d. Pipeline Seal and Insulator, Inc.

a) Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.

2.3 FIRE-RATED CABLE PATHWAY

2.4 All telecommunications cable bundles shall utilize an enclosed fire-rated pathway device wherever said cables penetrate rated walls. The fire-rated pathway shall contain a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed, or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479).

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product name or designation or comparable product by one of the following:

1. STI, Inc., EZ-Path
2. Wiremold

C. Cable pathway shall have an orange finish color and dimensions of 3 inches wide by 3 inches high by

1. 10.5 inches long.

D. Multiple cable pathways shall be installed in rated partitions utilizing manufacturer's recommended wall plate.

E. Cable pathway shall meet or exceed rating of partition where pathway is installed. Refer to architectural drawings for rating of partitions.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. General

1. Comply with NECA 1.
2. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
3. 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.
4. 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.
5. Right of Way: Give to piping systems installed at a required slope.
6. Furnish, deliver, erect, connect and finish in every detail, all materials, equipment and accessories required for the Work. Select and arrange to fit properly into the building spaces.
7. Perform all work in accordance with the drawings, specifications, including manufacturer's installation instructions, all applicable codes and NECA's Standard of Installation guidelines.
8. Include in the Work and in the bid proposal minor details not shown or specified, but manifestly necessary for the proper installation and operation of the various systems, as if specified or shown.
9. Position and install all material and equipment to permit proper access and in such a manner that maintenance, adjustment, calibration, inspection, repair and replacement of the material and equipment can be accomplished with minimum effort and cost.
10. Perform the installation, wiring, cleaning, testing, calibration and startup of all material and equipment in accordance with the manufacturers' instructions and recommendations. Such instructions and recommendations are hereby made a part of these Specifications.

11. If any departures from Contract Documents are deemed necessary, submit details of such departures and the reasons there for to Architect for approval.
12. Pull and junction boxes shall be located and sized by electrical contractor in accordance with NEC, EIA/TIA, utility company requirements and Owner standards, unless otherwise noted on the drawings.

B. Layout and Coordination

1. Lay out all work from approved building and property lines and benchmarks. Verify and be responsible for the correctness of all measurements in connection with work. Any change made in major overall dimensions as shown which affect the physical size, shape, or location of any part of the Work, whether due to field check or changes due to the use of equipment of a manufacturer other than that used as the basis of design shall not cause any interference with other work.
2. Examine the drawings of other trades and initiate cooperation and coordination of the Work with the work of other trades to insure that the Work can be installed properly as designed and planned without interference with other work or delay. Furnish all necessary templates, patterns, measurements, etc., for installing work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.
3. Investigate the structural and finish conditions affecting the Work. Offsets, bends or other items required by the Work may not be shown due to the small scale of the drawings; provide such offsets, bends or other items as required to meet structural or finish conditions.
4. Coordinate and be responsible for the required clearances of the Work in shafts, chases, double partitions and suspended ceilings. Coordinate and cooperate with the trades responsible for constructing such spaces, together with other trades sharing such spaces, and advise other trades of the requirements of the Work. Immediately submit for review space requirements that exceed those shown.
5. Install material and equipment as high as possible; at minimum, to clear the top of all doors, windows and other structural openings. Maintain maximum headroom and space conditions in every case. Where headroom or space conditions appear inadequate, notify the Architect before proceeding with the installation.
6. Install conduit, fittings, etc., to provide not less than 1/2 inch between their finished covering and the structure or adjacent work of any kind.
7. Communications equipment shall not interfere in any way with other material or equipment and shall be provided with adequate working space; see the National Electrical Code working space requirements.
8. Make reasonable modifications in the layout of the Work, as directed, to provide proper clearances or accessibility, or to prevent conflict with the work of other trades, at no increase in the Contract sum.
9. Cooperate fully with the Contractor for General Construction in regard to location of electrical equipment and work progress schedules. Notify him of all flush panelboard locations so that wall of proper thickness is provided.
10. Prepare large scale composite working drawings, including such section views and details as are necessary to clearly show how the Work is to be installed in relation to the work of other trades. Issue such drawings to the other trades for coordination of their work. Where such drawings show deviations from the Contract Drawings or conflict with other trades, detail and submit such deviation or conflicts to the Architect for review.
11. Locate wall switches at strike side of doors and at height indicated on "Mounting Height" schedule. Review all door swings with Contractor for General Construction prior to rough-in.
12. Locate receptacles at heights indicated in "Mounting Height" schedule. Mount receptacles vertically, ground pole at top. In special areas such as kitchens, laboratories, utility areas, coordinate locations with counters, benches and casework.

C. If work is installed before coordinating with all other trades and Owner's work, or so as to cause interference with the work of other trades, or so as not to provide proper access for maintenance or repair, make necessary changes in work to correct the condition at no cost to the Owner.
   1. Excavation, Trenching, Backfilling
      a. Mass excavation to required basic construction elevations will be performed under Division 31, EARTHWORK.
      b. Provide all other excavation, trenching and backfilling including shoring, sheeting, pumping, grading, barricading and other related work necessary for installation of electrical work.
      c. Perform work in accordance with the requirements of Division 31, EARTHWORK.

D. Cutting and Patching
   1. Except where specified otherwise in Division 27, provide cutting, patching and refinishing work in accord with the requirements of Division 01, GENERAL REQUIREMENTS.
   2. Horizontal chases shall not be cut into existing walls or partitions without approval of Architect.
   .

E. Painting
   1. Except where specified otherwise in Division 27, general painting will be provided under Division 09, FINISHES.

F. Touch up or paint out damage done to items having a factory applied finish, and which are installed under Division 27, utilizing materials and methods specified in Division 09. FINISHES.

G. Foundations
   1. Provide concrete foundations required for the work specified under Division 27, unless specifically noted otherwise. Be responsible for preparing foundation drawings and setting foundation anchor bolts in time so as not to delay the work. Concrete foundations shall be of the types detailed or as specified.
   2. Reinforce concrete foundations to suit the loads placed on them; foundations shall be in strict accordance with the equipment manufacturers' recommendations. Concrete materials and methods shall be as specified in Division 03, CONCRETE.
   3. Unless otherwise indicated, concrete equipment pads shall be provided under all switchgear, motor control centers, substations, etc., and shall extend a minimum 4 inches above the finished floor, at least 4 inches beyond the equipment base in all directions, shall have the top edges and vertical corners chamfered and shall have the same surface finish as the adjacent and surrounding floor.
   4. Securely anchor concrete foundations to the floor slab with steel dowels. When so indicated or where required, concrete foundations or concrete footings for structural steel supports for equipment too heavy to be placed in the floor slab shall be extended not less than 12 inches below the underside of the floor slab, except where bearing rock is encountered at a lesser depth. In such cases, after inspection and approval, concrete foundations may be set on bearing rock.
   5. Furnish and set, with proper templates, anchor bolts and inserts required for the proper attachment of the equipment to the concrete foundations. Anchor bolts shall be of the size and number required by the equipment or as recommended by the equipment manufacturer and shall be in accordance with the requirements detailed or specified. Anchor bolts shall also be compatible with vibration isolation requirements specified for the equipment.
   6. Set equipment anchor bolts in pipe sleeves at least two sizes larger than the anchor bolt. Length of pipe sleeve shall be the same as the imbedded length of the anchor bolt. After the equipment is set in place and adjusted to its proper position, completely fill the annular space between the anchor bolt and the inside of the pipe sleeve for the full length of the pipe sleeve with Embeco, or equivalent, nonshrink cement grout.
   7. Grout any openings between the top of the concrete foundation and the base of the equipment using nonshrink cement grout.

8. Piles, pile caps and foundation beams for exterior underground duct banks and for equipment foundations will be furnished under the General Construction Divisions of the Specifications.

H. Access Doors and Panels
1. Access doors and panels shown on the Architectural Drawings will be provided under Division 05, METALS.
2. Furnish other access panels required under Division 27 for installation under the General Construction Sections.
3. Furnish access panels for access to concealed junction/pull boxes, cabinets, terminal boxes and other equipment where other means of access is not available. Access panels shall be adequate in size for the service requirements, and shall not have a clear opening of less than 16 inches x 16 inches. Final size and location of access panels shall be subject to approval of the Architect. Cooperate with other trades so that the equipment will be accessible through the access panels.
4. Access panels shall be of steel construction, prime coated; have front panel fitted flush with the frame, with concealed hinge and latches; and shall be Inryco/Milcor, Style DW, K or M, to suit the construction and location.

I. Sleeves[, Fire-stops] and Waterseals
1. Provide each raceway or cable passing through a masonry or concrete wall, floor or partition with a sleeve made from standard weight steel pipe with smooth edges, securely and neatly cemented in place. Provide each raceway or cable passing through a wood or metal partition with a sleeve made from No. 22 gauge galvanized sheet metal, securely fastened in place.

J. Set floor sleeves flush with floor surface in finished areas; 1 inch above the finished floor in kitchens, cafeterias and similar service areas, mechanical rooms, pipe chases, pipe spaces and other unfinished areas, unless otherwise indicated, and flush with the underside of slabs. Wall and partition sleeves shall be flush with each surface unless otherwise indicated or specified.

K. Sleeves shall be 2 pipe sizes larger than the conduit or cable size unless otherwise required by the sealing method selected by the Contractor for Division 07, THERMAL AND MOISTURE PROTECTION. Coordinate with the Contractor for that section to determine requirements for sleeves, clearances, etc. Remove sleeve if required by UL listing for system selected.

L. Place sleeves in concrete floor or wall forms before concrete is poured. Sleeves shall have integral waterstop flanges, where they are to receive either watertight or hydrostatic seals.

M. Insure proper location and alignment of all sleeves for electrical work before and during concrete placement.

N. Where sleeves penetrate exterior walls, fill and seal ends around conduits and/or cables with duct sealant compound equal to Solorite KN-1146, or Link Seal. Install seals in accordance with the manufacturer's recommendations to provide airtightness above ground and hydrostatic sealing below grade. Caulking or other type mastic is not acceptable.

3.2 PROTECTION OF WORK

A. Protect all conduit, fittings, cabinets, racks, cable trays and other equipment before and during installation and keep clean.

B. Protect factory finished equipment and devices with approved temporary protective material where these items are subject to accidental damage or abuse. Communications equipment shall be stored indoors or otherwise securely protected and kept free of condensation by adequate electric heat. Contractor shall remove all temporary protective material at the conclusion of the Work or as directed.

C. The Contractor shall assume full responsibility for the cost of repairing or replacing any damaged Work or material caused by employees working under this Division.

3.3 TESTS

A. This article shall not be construed as deleting other tests specifically outlined in other sections of this Specification.

B. All materials and documentation to be furnished under this specification shall be subject to inspections and tests. Equipment and systems shall not be accepted until all required inspections and tests have been made, demonstrating that the equipment and systems conform to the specifications, and that all required equipment, systems, and documentation have been provided. The Owner reserves the right to request additional tests at no extra cost on any work that the Owner determines not to be in accordance with this specification.

C. The Owner shall have access to inspect the supplier/installer's quality assurance (QA) standards, procedures, and records that are applicable to this project. Inspection shall not relieve the supplier/installer of the responsibility for providing material and equipment conforming to the requirements of this specification.

D. Notify the Owner in writing of the test schedule at least two (2) weeks in advance. The test schedule shall be coordinated to permit the Design Professional to attend.

E. Twisted-Pair Media Tests - All UTP cables will be tested with equipment that meets or exceeds the requirements of TIA/EIA 568-B2 Level 2e and certified to ensure that the level of performance has been met. The tester must be calibrated with the cable used in the project to ensure that the correct NVP is utilized. The installation contractor shall provide documented proof that each line of the horizontal distribution system is capable of handling the required data rates. The customer may test random cables to ensure that they meet the documented test results provided. The installation contractor is responsible for correcting or reinstalling all systems that fail to perform to specification. The following is a summation of the tests that should be performed on a UTP cabling plant, basic link configuration. If any test indicates a lower level of performance, the link must be either repaired or replaced. The test instruments must have all the necessary tests preprogrammed into their logic circuits and require no further programming by the operator. The results must be available on both print out and on disk. All test reports will be provided to the Owner for future reference. The basic link shall be tested to the specifications set in EIA/TIA 568-B.2-1, Category 6 requirements. The basic link test results shall exceed "worst case" specifications as documented in the above said standard. The tests included are:

1. End To End Connectivity
2. Cable Delay Skew
3. Cable Length Testing
4. Insertion Loss
5. Worst Pair-to-Pair NearEnd Crosstalk (NEXT) Loss
6. Power Sum Near End Crosstalk (PSNEXT) Loss
7. Worst Pair-to-Pair Equal Level Far-EndCrosstalk (ELFEXT)
8. Power Sum Equal Level Far-End Crosstalk (PSELFEXT)
9. Propagation Delay
10. Return Loss, Measured from Local End
11. Return Loss, Measured from Far End

F. Optical Fiber Media Tests - Perform verification tests and enter results on the approved test sheets for all optical fiber cables as follows:

1. Visually inspect each installed optical fiber termination connector with an illuminated microscope. Inspect for scratches, pits or chips and reterminate if any of these conditions exist.
2. Measure end-to-end loss of each terminated optical fiber at 1300 nm and 850 nm wavelengths for multimode and at 1310 nm and 1550nm wavelengths for single mode.
3. Measure each terminated fiber length and signature with an optical time domain reflectometer (OTDR) from each end of the cable. The supplier/installer shall test each reel of cable prior to installation.
4. Replace any cable if any fiber within that cable exhibits greater than 0.2 dB localized attenuation or any discontinuities.
5. Verify polarity of all dual connectors.

G. Verify shield ground for riser distribution cables.

H. Replace any defective cabling system component if any applicable parameters do not meet the EIA/TIA Category 6 EIA/TIA 568-B.2-1.

I. Final Acceptance - The communications cabling system will not be considered accepted by the Owner until the certified results of the foregoing tests have been accepted by the Owner. Beneficial use of the system by the Owner will not be considered as acceptance.

J. Test Equipment shall be as follows:

1. Tester must have the functionality to test cables complying with current and upcoming proposed standards. Test frequency range must extend to 300 MHz.
2. Measurements must include: Wiremap, Length, Insertion Loss, PSNEXT, ACR, PSACR, ELFEXT, PSELFEXT, Return Loss, Resistance.
3. Autotest must comply with TIA/ISO/IEC standards, automatic increment of circuit ID.
4. Unit must have a replaceable, rechargeable battery, Flash ROM for field updates, and storage of 1000 Autotests.
5. Unit must be capable of testing single and multi-mode fiber optic cable with a supplied adapter.
6. Test results must be uploaded into a cable management software package that supports AutoCAD diagrams.
7. Unit shall be supplied with a carrying case and all necessary adapters to test any cable configuration installed and single mode fiber optic cables.
8. Tester shall be a Microtest OMNI Scanner, or approved equal.

3.4 WORKMANSHIP

A. Communications equipment shall be installed in a neat and workmanlike manner in accordance with latest and best practices of the trade.

B. Only mechanics skilled in this type of Work shall be employed and utilized by Contractor for this Division in the execution of this Work.

3.5 REFINISHING

A. A. All surfaces of boxes, cabinets and equipment shall have suitable lacquer, enamel or plated finishes. Touch up any finishes marred during construction. Supports and other metal work not furnished with a protective coating, shall be given two coats of approved paint after completion of the work.

3.6 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of wall.

F. Extend sleeves installed in floors [2 inches (50 mm)] <Insert dimension> above finished floor level.

G. Size pipe sleeves to provide [1/4-inch (6.4-mm)] <Insert dimension> annular clear space between sleeve and pathway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
   a. EDGEMONT SCHOOL DISTRICT FIRE ALARM, CLOCK & PA UPGRADES

a) COMMON WORK RESULTS FOR COMMUNICATIONS

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Fireproofing of conduit sleeves shall be installed upon completion of cable installation. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [steel] [cast-iron] pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.7 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.

3.8 FIRESTOPPING

A. A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.9 CONTINUITY OF EXISTING SERVICES

A. A. Perform alterations and connections to existing facilities with a minimum of interruption. Where interruption is necessary, prepare a time schedule for same, coordinate with Architect, Owner and other sections, and obtain prior written clearance from Owner. Provide and place notices in affected areas, and on luminaires or equipment, etc., which will be temporarily out of use. Remove notices when interruption has been completed.

3.10 ALTERATIONS AND CONNECTIONS TO EXISTING FACILITIES

A. Make all necessary alterations to existing DIVISION 27 systems to permit connecting or extending these systems to new work and to permit existing systems to remain in use whether indicated or not. New materials used to alter existing systems shall match existing materials unless otherwise indicated. Record modifications for Owner's future use.

B. Make all necessary alterations to existing DIVISION 27 systems to permit the installation of new DIVISION 23 equipment, i.e. ductwork and piping, to permit connecting or extending these systems to new work and to permit existing systems to remain in use whether indicated or not. New materials used to alter existing systems shall match existing materials unless otherwise indicated. Record modifications for Owner's future use.

C. Where equipment, ductwork and piping is removed or disconnected under DIVISION 27, perform the work in such a manner that no damage is done to the structure or remaining portions of the systems.

D. Remove exposed conduit, hangers and supports made obsolete due to this modification.

E. Where existing concealed conduit is not to be reused, abandon same in place unless otherwise indicated or specified.

F. Unless otherwise specified, all materials and equipment removed or disconnected by Contractor which are not to be reused shall be turned over to the Owner for his future use.

G. Where excavation for new electrical work disturbs support of any existing underground services, materials, equipment and structures, provide new and suitable concrete supports as required. Review supports and supporting methods with Architect before beginning work.

3.11 COMMISSIONING

A. Commissioning will be provided as specified in Division 01 Section “Commissioning”. All contractors and subcontractors of the various sections of this specification shall cooperate and participate in the commissioning work in accordance with requirements of Division 01 Section “Commissioning”.

B. Ensure participation of major equipment manufacturers or their representatives.

C. Equipment and systems/subsystems installed under this section are expected to be in full compliance with the design intent by the commissioning phase. Notify the Commissioning Agent when any specific piece of equipment or specific system/subsystem is ready for commissioning. Be prepared to demonstrate system readiness.

D. Equipment or systems/subsystems having incomplete work or exhibiting problems related to noncompliance with the design intent shall require commissioning. The contractor for this section shall be fully responsible to make all necessary corrections to incomplete or non-complying work at their own expense and shall pay the Commissioning Agent per diem rate for recommissioning such incomplete or non-complying work.

3.12 OWNER TRAINING

A. Provide basic training to Owner's IT personnel as designated by the Owner.

B. Provide additional training seminar to include fiber optic cable installation and termination techniques.

C. Provide cabling, jacks, tools and other devices as required to provide a "hands-on" learning experience. Provide Owner with one set of tools including, but not limited to, impact tool with two (2) spare blades, shears, knife and tool pouch.

D. Training shall take place at a time to be specified by the Owner. Provide a minimum of [two] [ ] days of training time.

E. Provide facilities to videotape the training session for the Owner's future use and turn over videotape(s) to the Owner.

END OF SECTION

SECTION 27 0528
PATHWAYS FOR COMMUNICATIONS 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. Optical-fiber-cable pathways and fittings.
   4. Metal wireways and auxiliary gutters.
   5. Nonmetallic wireways and auxiliary gutters.
   6. Metallic surface pathways.
   7. Nonmetallic surface pathways.
   8. Tele-power poles.
   9. Hooks.
   10. Boxes, enclosures, and cabinets.
   11. Polymer-concrete handholes and boxes for exterior underground cabling.
   12. Fiberglass handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid conduit.

C. IMC: Intermediate metal conduit.

D. RTRC: Reinforced thermosetting resin conduit.

1.4 ACTION SUBMITTALS

A. Product data for the following:
   1. Surface pathways
   2. Wireways and fittings.
   3. Tele-power poles.
   4. Boxes, enclosures, and cabinets.
   5. Underground handholes and boxes.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of pathway groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
   3. Underground ducts, piping, and structures in location of underground enclosures and handholes.

B. Qualification Data: For professional engineer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. General Requirements for Metal Conduits and Fittings:

B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

C. Comply with TIA-569-C.
   1. GRC: Comply with ANSI C80.1 and UL 6.
   2. ARC: Comply with ANSI C80.5 and UL 6A.
   3. IMC: Comply with ANSI C80.6 and UL 1242.
   4. PVC-Coated Steel Conduit: PVC-coated
      a. Comply with NEMA RN 1.
      b. Coating Thickness: 0.040 inch (1 mm), minimum.
   5. EMT: Comply with ANSI C80.3 and UL 797.
   6. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   7. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
   8. Fittings for EMT:
      a. Material: Steel
      b. Type: Set screw.
      c. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
      d. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
   9. 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 NONMETALLIC CONDUITS AND FITTINGS

A. General Requirements for Nonmetallic Conduits and Fittings:
   1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
   2. Comply with TIA-569-C.

B. RNC: Type EPC-40-PVC complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. Rigid HDPE: Comply with UL 651A.

D. Continuous HDPE: Comply with UL 651A.

E. RTRC: Comply with UL 2515A and NEMA TC 14.
   1. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.

F. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Description: Comply with UL 2024; flexible-type pathway, approved for plenum installation unless otherwise indicated.
   1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
   2. Comply with TIA-569-C.

2.4 SURFACE METAL PATHWAYS

A. Galvanized steel with snap-on covers, complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-C.

2.5 SURFACE NONMETALLIC PATHWAYS:

A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-C.

2.6 HOOKS

A. General Requirements for Hooks:
   1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
   2. Comply with TIA-569-C.
   3. Stamped steel.
   4. J shape.
   5. Installed every 4’-0” to center

2.7 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets:
   1. Comply with TIA-569-C.
   2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
   3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
   4. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

D. Metal Floor Boxes:
   1. Material: sheet metal.
   2. Type: Fully adjustable.
   3. Shape: Rectangular.
   4. Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   5. Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Indoors: Apply pathway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:
      a. Loading dock.

b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.
d. Gymnasiums

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic units in institutional and commercial kitchens and damp or wet locations.
8. Minimum Pathway Size: 3/4-inch (21-mm) trade size for copper and aluminum cables, and 1 inch (25 mm) for optical-fiber cables.
9. Pathway Fittings: Compatible with pathways and suitable for use and location.
10. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
11. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
12. EMT: Use set-screw fittings. Comply with NEMA FB 2.10.
13. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
14. Install surface pathways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-C.
4. NECA 101
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 270528.29 "Hangers and Supports for Communications Systems" for hangers and supports.

E. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling" for sleeves and sleeve seals for communications.

F. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

G. Complete pathway installation before starting conductor installation.

H. Arrange stub-ups so curved portions of bends are not visible above finished slab.

I. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

J. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for pathways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

O. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

P. 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.

Q. Cut conduit perpendicular to the length. For conduits of 2-inch (50-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

R. Install pull wires in empty pathways. 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. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

S. Surface Pathways:
   1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
   2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
   3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
   1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
   2. 1-Inch (25-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
   3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

U. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, 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 pathway-sealing fittings according to NFPA 70.

V. Install devices to seal pathway 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 pathways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service pathway enters a building or structure.

3. Where otherwise required by NFPA 70.

W. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

3.3 Expansion-Joint Fittings:

A. 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 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).

B. 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.

C. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

D. 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.

3.4 Cable Hooks:

A. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.

B. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.

C. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.

D. Space hooks no more than 4 feet (1.5 m) o.c.

E. Provide a hook at each change in direction.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS 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.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

B. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

C. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 27 1000
STRUCTURED CABLING

PART 2 PRODUCTS

1.1 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   2. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
   3. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.

C. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

1.2 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

END OF SECTION

SECTION 27 4116
INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT

PART 1 – GENERAL

1.1 WORK INCLUDED:

A. One complete Auditorium AV system.

1.2 RELATED WORK:

A. Division 26 – Electrical

B. Section 27 05 53 – Identification for Communications Systems

1.3 GENERAL OPERATION AND DESCRIPTION:

A. General:

1. The Contractor acknowledges and warrants that they have closely examined all the Contract Documents, that they are suitable and sufficient to enable the Contractor to complete the Work in the time allotted for the Contract Sum as accepted by the Owner and Consultant, and that they include all Work, whether or not shown or described, which reasonably may be inferred to be required or useful for the completion of the Work in full compliance with all applicable codes, laws, ordinances, rules, and regulations.
2. Design, engineer and provide complete means of support, suspension, attachment, fastening, bracing, and seismic restraints of the work of this section including existing and new installed equipment in accordance with local building codes and regulations. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction.
3. All conduit, back-boxes, and wiring for electrical are to be supplied and installed by a licensed electrical contractor.
4. Provide all cable and wire associated with this specification section and related documents.
5. All systems shall be completely installed with all of the necessary interconnection, power supplies, patch cords, snakes, portable equipment cables and wiring to provide a fully functioning system. The governing overall requirement for this project is a complete and functional system. Include work not usually shown or specified but necessary for proper installation and operation of the system or piece of equipment.
6. Execution of the Contract by the Contractor is a representation and warranty that the Contractor has carefully examined the Contract Documents, and represents and warrants that the Contractor is thoroughly familiar with the nature and location of the Work, the Site, the specific conditions under which the Work is to be performed, and all matters which may in any way affect the Work or its performance. The Contractor further represents that as a result of such examinations and investigations, the Contractor has thoroughly reviewed and understands the Contract Documents and their Intent and purpose, and is familiar with all applicable codes, ordinances, laws, regulations and rules as they apply to the Work, and that the Contractor will abide by same.
7. Claims for additional time or additional compensation as a result of the Contractor's failure to follow the foregoing procedure and to familiarize itself with all local conditions and the Contract Documents will not be permitted.
8. The term “provide” shall be defined as: designed, engineered, furnished, installed, certified and tested by the Integrator/Contractor.
9. Loose equipment or products supplied but not installed shall be turned-over to the Owner immediately upon delivery. Contractor is to supply a signed statement of transfer of this equipment to the consultant for record. Client must sign this statement acknowledging receipt of this equipment.
10. The Audio Contractor shall provide all wire and cable associated with this specification.
11. Where backing is required for the mounting of equipment, the Audio-Visual Integrator shall coordinate with the General contractor and Owner to insure backing is present and in appropriate locations.

12. The Audio-Visual Integrator shall perform all required control system configuration, programming, software, software set-up, calibration and re-calibration to provide a complete working system in accordance to the project specifications and Owner requirements. All Set up and adjustment of specified hardware and software.

B. System Description:
1. The Auditorium speaker system shall consist of Left/Right flown main speakers, ceiling mounted rear bleacher fill speakers, permanently mounted/flow stage monitors and portable stage monitors.
2. The Auditorium microphone system shall consist of wireless hand held and body pack transmitters, hanging stage microphones and numerous wired microphone inputs for general purpose use.
3. The Auditorium audio mixing and control system shall consist of a rack mount digital mixing board with remote iPad control and a rack mount DSP with a remote wall plate preset selector control. Presets shall configure the system for manual mixing with the mixing board or a simpler auto mix system that can be zoned for the entire auditorium, only the mains speakers, only the rear bleacher speakers or only the flown stage monitors allowing for the use of the stage as a standalone classroom. Auto mix inputs are limited to one wireless microphone, the stage floor box auxiliary input and audio from the projector.
4. The Auditorium video projection system shall consist of a high output digital projector and motorized screen.
5. The Auditorium video inputs shall be located in a stage floor box, stage face plate and in the equipment rack.
6. The Auditorium video control system shall utilize a wall mount button plate controlling projector on/off and screen up/down in a single pair of on/off buttons and four buttons selection between HDMI inputs one to four.
7. The audio system shall tie to the fire alarm system and mute when the alarm is activated.

1.4 QUALITY ASSURANCE:

A. Source Quality Control: Materials and equipment shall be new, unused and U.L. listed.

B. The system and components shall be supplied by manufacturers of established reputation and experience who shall have produced similar apparatus for a period of at least ten (10) years and who shall be able to refer to similar installations rendering satisfactory service.

C. The AV Systems shall be installed by the manufacturers' authorized distributor and installation contractor for the specified system, hereinafter known as the "AV System Trade." The installation shall include wiring, components, connections, adjustment, testing and certification. The Electrical Trade shall provide conduit, junction boxes and pull boxes as indicated and required by the AV System manufacturer's drawings or Trade instructions. The AV Trade shall furnish any special boxes, cabinets, enclosures and similar items to the Electrical Trade for installation by the Electrical Trade in accordance with the manufacturers' drawings, Trade instructions, and as indicated. The Public Address System Trade shall be NICET certified and shall have computer-aided acoustical analysis capabilities.

D. The AV System Trade shall furnish a list of similar or equal installations (a minimum of ten) and show at least twenty (20) years of company experience in this type of work.

1.5 REFERENCES:

A. The complete installation, including additions and modifications, shall be in accordance with:
1. National Electrical Code Article 760 & 800.
2. Minimum standards of Electronics Industries Association (EIA).

1.6 SUBMITTALS:

A. Submit shop drawings, analysis and product data in accordance with Section 27 05 00.
1. Shop Drawings the AV System manufacturer and Trade shall provide:
a. A one-line riser diagram indicating route and conduit size, external wiring and connections of system proposed.

b. Furnish complete operating instructions, including schematic and wiring diagrams of the system, engineering data sheets on each component and complete servicing data including part numbers of the various components.

c. The first sheet inside the submittal shall be a complete equipment list indicating the specific quantities to be furnished. The data sheet for each module of the system shall be listed net to the quantities. This information shall be furnished in the front of the submittal.

d. A specific description of the system shall be furnished describing each module and how it shall function in the system.

e. A specific drawing shall be made by the equipment supplier of the equipment rack. Each module shall be shown in its proper location with its terminal designations shown.

f. A data sheet shall be furnished for each module and device. The information shall be high-lighted or underlined, that applies to the particular module or device to be furnished.

g. A detailed diagram showing how to connect each device shall be furnished indicating exact final connection information.

a) Product Data: Submit application, technical, and installation data.

h. Submit Operation and Maintenance Manuals in accordance with Section 27 05 00.

1.7 WARRANTY, SERVICES:

A. The AV System manufacturer and Trade shall warrant the AV System for a minimum of one year from date of acceptance by Owner against defective parts and/or workmanship and shall provide parts and labor to fulfill this warranty at no cost to Owner.

B. Refer to Section 27 05 00 for submission of warranty.

C. Qualified service and parts shall be available to call on within a 150 mile basis.

D. The AV System Trade shall include in his quotation the cost of three (3) inspections of the system during the two (2) years subsequent to the installation. The Trade installing this equipment shall be prepared to offer the Owner a service contract after the guarantee period has ended. On-the-premises service furnished at other than normal working hours shall also be available and shall be charged at current labor rates. Sub-letting of this service shall disqualify the bidder.

PART 2 - PRODUCTS [S] [O/M]

2.1 GENERAL:

A. Materials and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as components of the specified systems.

B. Where a particular material, device, piece of equipment or system is specified directly, the current manufacturer's specification for the same shall be considered to be a part of these specifications, as if completely contained herein in every detail.

C. All materials and products will be new and of professional quality. Unless specifically stated in the drawings or specifications, no existing or used materials will be installed.

D. Provide the quantity of products as shown on the Contract Drawings, or as otherwise indicated herein.

E. The equipment listed in section 2.02 consists of all major equipment for the project. The Contractor will integrate these into the system design and provide any additional components, wiring, programming, etc., to complete a functional system operating as described within the specifications and the category AV drawings.

F. Components or equipment not specified or indicated on the drawings that are required to make a fully functional systems per the Owner's requirements and the design intent, shall be furnished and installed by the Contractor, and shall be submitted for Owner review.

2.2 MATERIALS AND EQUIPMENT:

Qty	Item	Manufacturer	Notes

4	AFI-4W	Apogee Sound	Main Speakers
4	AFI-4 Vertical Yoke	Apogee Sound	Speaker Mount
2	AFI-2	Apogee Sound	Stage Fold Back Speakers
2	AFI-2 Yoke	Apogee Sound	Speaker Mount
4	HFCS1LPW	Bogen	16 Ohm Ceiling Speaker, Bleacher Speakers
4	TBCR	Bogen	Speaker Tile Bridge
4	CK10	Bogen	Safety Cable
2	CP8	QSC	Powered Floor Monitors
1	X32Rack	Behringer	Rack Mount Mixer
1	S16	Behringer	Mixer Aux Inputs
2	M600	Bogen	Amplifier
1	CORE 8x8	Bogen	System Processor / Mixer
1	RAC8	Bogen	Remote Volume / Source Selector
5	D-J1	RDL	Hanging Mic Input Plate
1	D-XLR2F	RDL	Dual Mic Input Plate
1	D-XLR2M	RDL	Dual XLR Output Plate
2	D-CIJ3D	RDL	Line Input Plate
1	DN-300BR	Denon	Bluetooth RX
3	UF-20R	JTS	Wireless RX 2CH
2	**JSS-20**	**JTS**	**Hand Held Wireless Mic**
4	**UF-20BT**	**JTS**	**Body Pack Transmitter**
4	**CM-214**	**JTS**	**Head Worn Mic Wireless System**
5	**CVO**	**Shure**	**Hanging Stage Mic**
1	**LS-55-072**	**Listen Technologies**	**Assistive Listening System**
			Receivers, Headphones and Loops per Occupancy
1	**CN-2400S**	**Furman Sound**	**Power Sequencer**
1	**CN20MP**	**Furman Sound**	**Power Sequencer Expander**
1	**PL PLUSC**	**Furman Sound**	**Power Conditioner with Lights**
2	**SS**	**Middle Atlantic**	**Pullout Rack Shelf**
2	**D4**	**Middle Atlantic**	**4 RU Rack Drawer**
1	**SR46-28**	**Middle Atlantic**	**46RU Wall Mount Rotating Rack**
1	**VFD-46**	**Middle Atlantic**	**Vented Locking Front Door**
1	**FL-540P-5-B**	**FSR**	**Stage Floor Box**
1	**FL-540P-BLK-C**	**FSR**	**Stage Box Cover**
1	**PJ WUL6690**	**Richo**	**9,600 Lumen 16:10 1900x1200 Laser Projector**
1	**VCMU**	**Chief**	**Projector Mount**
1	**Tensioned Large Advantage**	**Da-Lite**	**HD Progressive .6 Screen, 283" Diag (240x150)**
2	**WP-20CT/US-D**	**Kramer**	**USB C and HDMI Wall Plate Extender**
3	**TP-789R**	**Kramer**	**Video Extender Receiver**
1	**TP-780T**	**Kramer**	**Video Extender Transmitter**
1	**RC-306**	**Kramer**	**Wall Controller**

1	**VS411X**	**Kramer**	**4x1 HDMI Auto Switcher**
1	**NS801W**	**Hubbell**	**HDMI Decora Plate**
1	**WPD-RP**	**AtlasIED**	**3RU 5 Opening Decora Rack Plate**

PART 3 - EXECUTION

3.1 INSPECTION:

A. The AV System Trade shall be responsible for all arrange-ments for testing and approval of the System before the System is accepted by the Owner and Architect/Engineer.

3.2 INSTALLATION:

A. General: Provide all wire, conduit, outlets and equipment as on the drawings and as specified here-in for a complete public address system. All material and/or equipment necessary for the proper operation of the system, even though not specifically mentioned in the Contract Documents, shall be deemed part of this Contract. All equipment shall be installed and connected in strict accordance with the manufacturer's recommended instructions. So as to provide for matched systems for service maintenance from one source, all equipment shall be furnished by one equipment supplier.

B. Wiring:

1. Complete Conduit Raceway System Option:

a. All wiring methods shall be in accordance with NFPA-70, Article 800, and all other codes specified herein. Provide proper number, size of wires and conduit as required for operation of the system in accordance with the manufacturer's instructions. Boxes and conduit shall be provided by Division 26.

a) Wiring Methods: All wiring shall be in conduit systems.

(a) No wiring other than that directly associated with AV systems shall be permitted in this system's conduits.

(b) Wiring splices are to be avoided to the extent possible, and if needed they must be made only in junction boxes and shall be crimp connected.

(c) Transposing or changing color coding of wires shall not be permitted.

(d) Wire nut-type connections are not acceptable.

(e) All conductors shall be labeled on each end with "E-Z markers" or equivalent.

(f) Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its termination.

(g) Cabinet terminals shall be numbered and coded. All controls, function switches, etc., shall be clearly labeled on all equipment panels.

(h) All connections to panels, devices and equipment shall be made with crimp type terminal connections, or resin core solder method approved by manufacturer.

(i) All wiring shall be checked and tested to insure that there are no grounds, opens or shorts.

(j) Microphone line shields are to be grounded only at the micro-phone connector and at the mixer-preamp input connectors. Shields on cables between accessory items of equipment are to be grounded at one end only. All cable shields are to be insulated at the "floating" end. Continuity of shield is to be preserved at all connecting points. All audio grounds in any equipment rack, as well as the racks themselves, are to be earth grounded.

(k) All wiring shall be executed in strict adherence to standard broadcast practices. Lines for microphone level circuits (level below -20 dBm), line level circuits (up to +30 dBm), loudspeaker circuits (above +30 dBm), and

power circuits all installed in separate conduits. All conduits shall be well spaced from power conduits, and shall be properly grounded to the power system ground. Lines in conduit are not to be spliced.

2. All boxes, conduits, etc., shall be of proper size, shall be clearly marked for easy identifi-cation and continuously bonded together and grounded to the Building Grounding Electrode System (BGES).
3. All equipment except portable equipment shall be firmly held in place. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three.
4. The AV System Trade shall take such precautions as are necessary to prevent and guard against E.M.I., to supply adequate ventilation, and to install the equipment so as to provide reasonable safety for the operator.
5. The actual circuit routing of the AV System shall be by the installing trade based on the location of the devices, circuit limitations and wire limitations.
6. Coordinate ceiling speaker enclosures with structural and mechanical systems. Exact locations of ceiling speakers shall be determined and coordinated on the job.
7. Wireless microphone antennas shall be installed to allow reception from the auditorium or at the stage.
8. This AV system shall be muted by a relay during an emergency transmission.
9. AV system shall have structural brackets and flyware to support speakes, projectors, screens and displays from the structural elements. The AV System trade shall engage the services of a Registered Structural Engineer to design the support system for the speaker systems specified. The support systems shall be reviewed by this Project Architect/Engineer for acceptance and coordination of systems.
    a. Exact speaker location, aiming and adjustments shall be performed in the field. Speaker locations shall be coordinated with ductwork, lighting, fire protection system piping, etc. as required. Speaker aiming and placement shall be such that there is a minimal difference in sound pressure levels in all areas. Equalization shall be performed via pink noise generator and associated microphone and shall be done automatically with no manual adjustments. All delay settings for rear fill speakers shall be calibrated and set in the field so that there is no notable difference in signal from the front and rear suspended speakers.

3.3 TECHNICAL ASSISTANCE:

A. Instruction: The installation supervising technician for the AV System Trade shall instruct the proper designated authority on the correct operation of the system after the installation is completed. This instruction shall consist of:
    1. Two hours of technical service training to the Owner's technical staff using the factory operation manuals previously specified.
    2. All training specified herein shall be performed by a factory certified technician.

3.4 FIELD QUALITY CONTROL:

A. Upon completion of the installation, the AV System Trade's factory-trained technician shall perform all necessary electrical tests and adjustments and who shall then submit a Letter of Certification to the Owner/Architect/Engineer that the system functions and conforms to all requirements of the manufacturer of the equipment, these specifications, and all requirements of Uniform Statewide Building Code for type of building in which the system is installed.

B. Final systems quality and performance, testing, calibrating and overall commissioning shall be performed by the installer prior to the commencement of owner training. Installer shall furnish all labor, instruments, equipment, temporary power, and materials necessary to perform the system tests outline below at no additional cost. The system shall be fully tested and operational before final inspection.

C. Test that all circuits and wiring are free of shorts and grounds and that all wiring has been terminated in the proper polarity, including loudspeaker polarity tests.

D. Test each wired microphone input with a single hand held microphone. Set mixer input gain and any available channel equalization for clear well balanced sound. Copy these setting to like input channels and test these channels with the test microphone listening for uniformity in volume and tonality.

E. Preset all wireless microphone frequencies and insure that all microphones work properly when on simultaneously. Set mixer input channel gain and any available channel equalization for clear well balanced sound. Copy these setting to all input channels associated with like microphone types and test these microphone/channel combinations listening for uniformity in volume and tonality.

F. Test each line level input. Attached one line level sources to its respective input. Adjust the gain and tone controls for a normal operating level. Confirm the sound is clear and free from mechanical rattles and electronic hiss, buzz or hum. Duplicate these settings on every line level input and confirm that when the test source is moved from channel to channel the overall sound quality is the same and that none of the problems listed above exists.

G. Measure the acoustic performance of the sound system with a TEF, SMAART or an equivalent high-resolution system. Parametric equalization shall be performed to obtain the most uniform response possible over the listening area. Slight re-aiming of the loudspeakers may be required at this stage to insure both proper coverage and acceptable gain-before-feedback. The target frequency response in the room will be smooth and uniform with a slight rise of no more than 6dB in low frequencies below 150Hz and a flat to slightly declining response above 4kHz.

H. Parametric equalization shall be used with the exception of 1/3-octave graphic equalizers when they are provided for use with floor monitors.

I. Post equalization DSP settings should be saved to a removable media and should be kept on file for use in the event of DSP failure. This file shall be transmitted to the Engineer as part of the close-out documents.

J. Insure the system and all components are free of mechanical rattles and vibrations. A sine wave sweep shall be performed at 1/8th amplifier power between 20Hz and 300Hz. Any noise generated by sympathetic resonance of speaker, speaker rigging components or other materials installed by the Sound System Installer shall be address and eliminated. Noise generated by resonance in materials installed by other trades shall be noted and transmitted to those trades for correction if possible.

K. The Sound System Installer shall confirm the system gain structure is set properly, allowing for Show-Level program to occur without system components clipping or overloading. In the audience seats, no audible hiss, buzz or hum shall be present

L. All microphones shall be rung-out. Each of the mixing board input gains and channel equalizers should be set for both a natural sound and high gain-before-feedback. Reproduction of speech shall be clear, high fidelity and with frequencies within range of system reproduced without detectable noise, hum and distortion. Confirm microphone equalization and room equalization is adequate to properly control acoustic feed-back at normal operating levels. Adjust as necessary.

M. Confirm all other sources and systems are setup, adjusted and functioning properly including but not limited to DSP and Remote control panel programming, Assisted Listening Systems, intercom systems and recording systems.

N. Verify all user interface panels are fully programed and functional.

O. Verify all projectors and displays are calibrated.

P. The factory trained technician shall perform all electrical and mech-anical tests, measurements and adjustments required. All test costs shall be in the Contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.
2. Indication that all equipment is properly installed and functions and conforms with these specifications.
3. Technician's name, certificate number and date.

4. After completion of all tests, measurements and adjustments listed above, the AV System Trade shall submit the following information to the Architect/Engineer.
   a. "As-built" conduit layout diagrams including wire color code and/or tag number.
   b. Complete "as-built" wiring diagrams.
   c. Complete operating instructions, including engineering data sheets on each major component and complete servicing data including part numbers of the various components.
5. The completed AV System shall be tested to insure that it is operating properly. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any problems. Should a problem occur, the Public Address System Trade shall readjust or replace the defective components and begin another ninety (90) day test period. This test shall not start until the Owner has obtained beneficial use of the building under tests.
6. If the requirements provided in the paragraph above are not completed within one (1) year after beginning the tests described therein, the AV System Trade shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Architect/Engineer.

END OF SECTION

SECTION 27 5116
PUBLIC ADDRESS 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. Preamplifiers.
2. Power amplifiers.
3. Transfer to standby amplifier.
4. Microphones.
5. Volume limiter/compressors.
6. Control console.
7. Equipment cabinet.
8. Equipment rack.
9. Telephone paging adapters.
10. Tone generator.
11. Monitor panel.
12. Loudspeakers.
13. Noise-operated gain controllers.
14. Microphone and headphone outlets.
15. Battery backup power unit.
16. Conductors and cables.
17. Pathways.

1.3 DEFINITIONS

A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.

B. VU: Volume unit.

C. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Power, signal, and control wiring.
1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
3. Console layouts.
4. Control panels.
5. Rack arrangements.
6. Calculations: For sizing backup battery.
7. Wiring Diagrams: For power, signal, and control wiring.
a. Identify terminals to facilitate installation, operation, and maintenance.
b. Single-line diagram showing interconnection of components.

c. Cabling diagram showing cable routing.

C. Delegated-Design Submittal: For supports and seismic restraints for control consoles, equipment cabinets and racks, and components indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of supports and seismic restraints for control consoles, equipment cabinets and racks, and components.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings are shown and coordinated with each other, using input from installers of the items involved.

B. Qualification Data: For Installer:

C. Seismic Qualification Certificates: For control consoles, equipment cabinets and racks, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Include qualification data for testing agency.
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.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For public address systems to include in emergency, operation, and maintenance manuals.

B. In addition to items specified in Section 017700 "Closeout Procedures" and Section 017823 "Operation and Maintenance Data," include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
2. Operating instructions laminated and mounted adjacent to operating console location.
3. Training plan.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. None required

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain public address system from single source from single manufacturer.

B. The manufacturer for the Paging System shall be tied to the Bogen Nyquist E7000 educational series

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. System Functions:

1. Selectively connect any zone to any available signal channel.
2. Selectively control sound from microphone outlets and other inputs.

3. "All-call" feature shall connect the all-call sound signal simultaneously to all zones regardless of zone or channel switch settings.
4. Telephone paging adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.
5. Produce a program-signal tone that is amplified and sounded over all speakers, overriding signals currently being distributed.
6. Reproduce high-quality sound that is free of noise and distortion at all loudspeakers at all times during equipment operation including standby mode with inputs off; output free of nonuniform coverage of amplified sound.

2.3 SYSTEM DESCRIPTION

A. Compatibility of Components: Coordinate component features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch (483-mm) housing complying with EIA/ECA-310-E.

D. A.

E. Weather-Resistant Equipment: Listed and labeled by a qualified testing agency for duty outdoors or in damp locations.

2.4 PREAMPLIFIERS

A. Preamplifier: Separately mounted.

B. Preamplifier: Integral to power amplifier.

C. Output Power: Plus 4 dB above 1 mW at matched power-amplifier load.

D. Total Harmonic Distortion: Less than 1 percent.

E. Frequency Response: Within plus or minus 2 dB from 20 to 20,000 Hz.

F. Input Jacks: Minimum of three. One matched for low-impedance microphone; one USB port; and the other matchable to DVD or CD player, or radio tuner signals without external adapters.

G. Minimum Noise Level: Minus 55 dB below rated output.

H. Controls: On-off, input levels, and master gain.

2.5 POWER AMPLIFIERS

A. Mounting: Rack.

B. Output Power: 70-V balanced line. 80 percent of the sum of wattage settings of connected for each station and speaker connected in all-call mode of operation, plus a 25 percent allowance for future stations.

C. Total Harmonic Distortion: Less than 3 percent at rated power output from 50 to 12,000 Hz.

D. Minimum Signal-to-Noise Ratio: 80 dB, at rated output.

E. Frequency Response: Within plus or minus 3 dB from 20 to 12,000 Hz.

F. Output Regulation: Less than 2 dB from full to no load.

G. Controls: On-off, input levels, and low-cut filter.

H. Input Sensitivity: Matched to preamplifier and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphone or handset transmitter.

I. TRANSFER TO STANDBY AMPLIFIER

1. Monitoring Circuit and Sensing Relay: Detect reduction in output of power amplifier of 40 percent or more and, in such event, transfer load and signal automatically to standby amplifier.

2.6 MICROPHONES

A. Paging Microphone:
   1. Type: Dynamic, with omnidirectional polar characteristic.
   2. Impedance: 250 ohms.
   3. Frequency Response: Uniform, 50 to 15,000 Hz.
   4. Sensitivity: Minus 70 dB.
   5. Output Level: Minus 58 dB, minimum.
   6. Cable: Coordinate impedance with microphone impedance.
   7. Mounting: Desk stand with integral-locking, press-to-talk switch.

2.7 VOLUME LIMITER/COMPRESSOR

A. Minimum Performance Requirements:
   1. Frequency Response: 45 to 15,000 Hz, plus or minus 1 dB minimum.
   2. Reduction Ratio: Automatically vary compression ratio, and attack and release times for voice and music inputs.
      a. Compression Ratio Range: 3:1 to 10:1 minimum.
      b. Averaging Compressor Attack Time: Up to 500 milliseconds.
      c. Signal Fast Compression Attack Time: Less than 10 milliseconds.
      d. Release time: Up to 500 milliseconds.
   3. Distortion: 0.5 percent, maximum.
   4. Rated Output: Minimum of plus 14 dB.
   5. Inputs: Minimum of two inputs with variable front-panel gain controls and VU or decibel meter for input adjustment.
   6. Rack mounted.

2.8 CONTROL CONSOLE

A. Panel for Equipment and Controls: Rack mounted.

B. Controls:
   1. Switching devices to select signal sources for distribution channels.
   2. Program selector switch to select source for each program channel.
   3. Switching devices to select zones for paging.
   4. All-call selector switch.

C. Indicators: A visual annunciation for each distribution channel to indicate source being used.

D. Self-Contained Power and Control Unit: A single assembly of basic control, electronics, and power supply necessary to accomplish specified functions.

E. Spare Positions: 25 percent spare zone control and annunciation positions on console.

F. Microphone jack.

2.9 EQUIPMENT CABINET

A. Comply with EIA/ECA-310-E.

B. House amplifiers and auxiliary equipment at each location.

C. Cabinet Housing:
   1. Constructed of 0.0478-inch (1.2-mm) steel, minimum, with front- and rear-locking doors and standard EIA/ECA-310-E-compliant, 19-inch (483-mm) racks.
   2. Arranged for floor or wall mounting as indicated.
   3. Sized to house all equipment indicated, plus spare capacity.
   4. Include 20 percent minimum spare capacity for future equipment in addition to space required for DVD or CD player.

a. Power Provisions: A single switch in cabinet shall disconnect cabinet power distribution system and electrical outlets, which shall be uniformly spaced to accommodate ac-power cords for each item of equipment.

b. Ventilation: A low-noise fan for forced-air cabinet ventilation. Fan shall be equipped with a filtered input vent and shall be connected to operate from 105- to 130-V ac, 60 Hz; separately fused and switched; arranged to be powered when main cabinet power switch is on.

2.10 EQUIPMENT RACK

A. Racks: 19 inches (483 mm) standard, complying with EIA/ECA-310-E.

B. Power-Supply Connections: Compatible plugs and receptacles.

C. Enclosure Panels: Ventilated rear and sides and solid top. Use louvers in panels to ensure adequate ventilation.

D. Finish: Uniform, baked-enamel factory finish over rust-inhibiting primer.

E. Power-Control Panel: On front of equipment housing, with master power on-off switch and pilot light; and with cartridge fuse protection for rack equipment power.

F. Service Light: At top rear of rack with an adjacent control switch.

G. Vertical Plug Strip: Grounded receptacles, 12 inches (300 mm) o.c.; the full height of rack for public address system equipment use only.

H. Maintenance Receptacles: Duplex convenience outlets supplied independent of vertical plug strip and located in front and bottom rear of rack.

I. Spare Capacity: 20 percent in rack for future equipment.

J. TELEPHONE PAGING ADAPTER

1. Adapters shall accept voice signals from telephone extension dialing access and automatically provide amplifier input and program override for preselected zones.
   a. Minimum Frequency Response: Flat, 200 to 2500 Hz.
   b. Impedance Matching: Adapter matches telephone line to public address equipment input.
   c. Rack mounted.

2.11 TONE GENERATOR

A. Tone generator shall provide clock and program interface with public address system.

B. Signals: Minimum of seven distinct, audible signal types including wail, warble, high/low, alarm, repeating and single-stroke chimes, and tone.

C. Pitch Control: Chimes and tone.

D. Volume Control: All outputs.

E. Activation-Switch Network: Establishes priority and hierarchy of output signals produced by different activation setups.

F. Mounting: Rack

2.12 MONITOR PANEL

A. Monitor power amplifiers.

B. Components: VU or dB meter, speaker with volume control, and multiple-position rotary selector switch.

C. Selector Switch and Volume Control: Selective monitoring of output of each separate power amplifier via VU or dB meter and speaker.

D. Mounting: Rack

2.13 LOUDSPEAKERS

A. Cone-Type Loudspeakers:

1. Minimum Axial Sensitivity: 91 dB at 1 m, with 1-W input.
2. Frequency Response: Within plus or minus 3 dB from 50 to 15,000 Hz.
3. Size: 8 inches200 mm with 1-inch (25-mm) voice coil and minimum 5-oz. (140-g) ceramic magnet.
4. Rated Output Level: 25/70 W.
5. Minimum Dispersion Angle: 100 degrees.
6. Matching Transformer: Full-power rated with four taps. Maximum insertion loss of 0.5 dB.
7. Surface-Mounted Units: Ceiling, wall, or pendant mounted, as indicated, in steel back boxes, acoustically dampened. Front face of at least 0.0478-inch (1.2-mm) steel and whole assembly rust proofed and shop primed for field painting.
8. Flush-Ceiling-Mounted Units: In steel back boxes, acoustically dampened. Metal ceiling grille with white baked enamel.

B. Horn-Type Loudspeakers:
1. Type: Single-horn units, double-reentrant design, with minimum full-range power rating of 15 W.
2. Matching Transformer: Full-power rated with four standard taps. Maximum insertion loss of
3. 0.5 dB.
4. Frequency Response: Within plus or minus 3 dB from 250 to 12,000 Hz.
5. Dispersion Angle: 130 by 110 degrees.
6. Mounting: Integral bracket.
7. 1.
8. Units in Damp, Wet, or Outdoor Locations: Listed and labeled for environment in which they are located.
9. Units in Hazardous (Classified) Locations: Listed and labeled for environment in which they are located. Provide any accessories required to maintain listing.

2.14 NOISE-OPERATED GAIN CONTROLLER

A. Gain controller shall be designed to continuously sense space noise level and automatically adjust signal level to local speakers.

B. Frequency Response: 20 to 20,000 Hz, plus or minus 1 dB.

C. Level Adjustment Range: 30 dB minimum.

D. Maximum Distortion: 0.5 percent.

E. Control: Permits adjustment of sensing level of device.

2.15 OUTLETS

A. Volume Attenuator Station: Wall-plate-mounted autotransformer type with paging priority feature.
1. Wattage Rating: 10 W unless otherwise indicated.
2. Attenuation per Step: 3 dB, with positive off position.
3. Insertion Loss: 0.4 dB maximum.
4. Attenuation Bypass Relay: SPDT. Connected to operate and bypass attenuation when all-call, paging, program signal, or prerecorded message features are used. Relay returns to normal position at end of priority transmission.
5. Label: "PA Volume."

B. Microphone Outlet: Three-pole, polarized, locking-type, microphone receptacles in single-gang boxes. Equip wall outlets with brushed stainless-steel device plates. Equip floor outlets with gray tapered rubber or plastic cable nozzles and fixed outlet covers.

C. Headphone Outlet (for the Hearing Impaired): Microphone receptacles in single-gang boxes. Equip wall outlets with brushed stainless-steel device plates. Equip floor outlets with gray tapered rubber or plastic cable nozzles and fixed-outlet covers.

2.16 BATTERY BACKUP POWER UNIT

A. Unit shall be rack mounted, consisting of time-delay relay, sealed lead-calcium battery, battery charger, on-off switch, "normal" and "emergency" indicating lights, and adequate capacity to supply maximum equipment power requirements for one hour of continuous full operation.

B. Unit shall supply public address equipment with 12- to 15-V dc power automatically during an outage of normal 120-V ac power.

C. Battery shall be on float charge when not supplying system and able to transfer automatically to supply system after three to five seconds of continuous outage of normal power, as sensed by time-delay relay.

D. Unit shall automatically retransfer system to normal supply when normal power has been reestablished for three to five seconds continuously.

2.17 CONDUCTORS AND CABLES

A. Jacketed, twisted pair and twisted multipair, untinned solid copper.
   1. Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.
   2. Microphone Cables: Neoprene jacketed, not less than 2/64 inch (0.8 mm) thick, over shield with filled interstices. Shield No. 34 AWG, tinned, soft-copper strands formed into a braid or approved equivalent foil. Shielding coverage on conductors is not less than 60 percent.
   3. Plenum Cable: Listed and labeled for plenum installation.

2.18 PATHWAYS

A. Conduit and Boxes: Comply with Section 270528 "Pathways for Communications Systems Flexible metal conduit shall not be used.
   1. Outlet boxes shall be not less than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters, and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal pathway and cables except in unfinished spaces.
   1. Install plenum cable in environmental air spaces, including plenum ceilings.
   2. Comply with requirements for pathways and boxes specified in Section 270528 "Pathways for Communications Systems."
      a. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
      b. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements in Section 270528 "Pathways for Communications Systems." for installation of conduits and wireways.

B. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Cable Installation Requirements:
   1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.

2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.

C. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceiling by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate pathways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other communication equipment conductors as recommended by equipment manufacturer.

3.4 INSTALLATION

A. Coordinate layout and installation of system components and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

C. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

D. Equipment Cabinets and Racks:
1. Group items of same function together, either vertically or side by side, and arrange controls symmetrically. Mount monitor panel above the amplifiers.
2. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.
3. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.

E. Volume Limiter/Compressor: Equip each zone with a volume limiter/compressor. Install in central equipment cabinet. Arrange to provide a constant input to power amplifiers.

F. Wall-Mounted Outlets: Flush mounted.

G. Floor-Mounted Outlets: Conceal in floor and install cable nozzles through outlet covers. Secure outlet covers in place. Trim with carpet in carpeted areas.

H. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

I. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

J. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

K. Connect wiring according to Section 271500 "Communications Horizontal Cabling" and Section 280513 "Conductors and Cables for Electronic Safety and Security."

3.5 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes as specified in Section 270526 "Grounding and Bonding for Communications Systems."

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 factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:
   1. Schedule tests with at least seven days' advance notice of test performance.
   2. After installing public address system and after electrical circuitry has been energized, test for compliance with requirements.

E. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.

F. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:
   1. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.
   2. Repeat test for each separately controlled zone of loudspeakers.
   3. Minimum acceptance ratio is 50 dB.

G. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.

H. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.

I. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

J. Signal Ground Test: Measure and report ground resistance at public address equipment signal ground. Comply with testing requirements specified in Section 270526 "Grounding and Bonding for Communications Systems."

K. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

L. Public address system will be considered defective if it does not pass tests and inspections.

M. Prepare test and inspection reports.

1. Include a record of final speaker-line matching transformer-tap settings and signal ground-resistance measurement certified by Installer.

3.7 ADJUSTING

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain the public address system and equipment. Refer to Section 017900 "Demonstration and Training."

END OF SECTION

SECTION 28 4621
ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Addressable interface device.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.

3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Include voltage drop calculations for notification-appliance circuits.
5. Include battery-size calculations.
6. Include input/output matrix.
7. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
8. Include performance parameters and installation details for each detector.
   a. Locate detectors according to manufacturer's written recommendations.
9. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

   a. Trained and certified by manufacturer in fire-alarm system design.
   b. NICET-certified, fire-alarm technician; Level III minimum.
   c. Licensed or certified by authorities having jurisdiction.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

   a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
   c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
   d. Riser diagram.
   e. Device addresses.
   f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

g. Manufacturer's required maintenance related to system warranty requirements.
h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
3. Smoke Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
5. Audible and Visual Notification Appliances: One of each type installed.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FM Global-approved alarm company.

1.9 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Architect no fewer than seven days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Architect's written permission.

C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.10 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice/strobe evacuation.

C. All components provided shall be listed for use with the selected system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Carbon monoxide detectors.

5. Automatic sprinkler system water flow.
6. Preaction system.
7. Fire standpipe system.
8. Dry system pressure flow switch.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances, including voice evacuation notices.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Activate voice/alarm communication system.
5. Activate preaction system.
6. Recall elevators to primary or alternate recall floors.
7. Activate elevator power shunt trip.
8. Record events in the system memory.
9. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
3. Elevator shunt-trip supervision.
4. Independent fire-detection and -suppression systems.
5. User disabling of zones or individual devices.
6. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Voice signal amplifier failure.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.

2.3 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Edwards System Technologies (EST)

B. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class A.
2. Pathway Survivability: Level 1.
3. Install no more than 100 addressable devices on each signaling-line circuit.

C. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

D. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

E. Elevator Recall:

1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:

a. Elevator lobby detectors except the lobby detector on the designated floor.
b. Smoke detector in elevator machine room.
c. Smoke detectors in elevator hoistway.

2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

F. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

G. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided as a special module that is part of fire-alarm control unit.

1. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711.

a. Allow the application of, and evacuation signal to, indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
b. Programmable tone and message sequence selection.
c. Standard digitally recorded messages for "Evacuation" and "All Clear."
d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of fire-alarm control unit.

2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

H. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

K. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 PREACTION SYSTEM

A. Initiate Presignal Alarm: This function shall cause an audible and visual alarm and indication to be provided at the FACP. Activation of an initiation device connected as part of a preaction system shall be annunciated at the FACP only, without activation of the general evacuation alarm.

2.5 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Edwards System Technologies (EST).

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.6 SYSTEM SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Edwards System Technologies (EST).

B. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

C. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

2.7 PROJECTED BEAM SMOKE DETECTORS

A. Projected Beam Light Source and Receiver: Designed to accommodate small angular movements and continue to operate and not cause nuisance alarms.

B. Detector Address: Accessible from fire-alarm control unit and able to identify the detector's location within the system and its sensitivity setting.

C. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

1. Primary status.
2. Device type.
3. Present average value.
4. Present sensitivity selected.
5. Sensor range (normal, dirty, etc.).

2.8 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Comply with UL 2075.
6. Locate, mount, and wire according to manufacturer's written instructions.
7. Provide means for addressable connection to fire-alarm system.
8. Test button simulates an alarm condition.

2.9 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Edwards System Technologies (EST).

B. General Requirements for Heat Detectors: Comply with UL 521.

1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 135 deg F.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.10 NOTIFICATION APPLIANCES

A. Manufacturers: Subject to compliance with requirements, provide products by the following]:

1. Edwards System Technologies (EST).

B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

C. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch high letters on the lens.

1. Rated Light Output:

a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, white.

D. Voice/Tone Notification Appliances:

1. Comply with UL 1480.
2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
3. High-Range Units: Rated 2 to 15 W.
4. Low-Range Units: Rated 1 to 2 W.
5. Mounting: surface mounted and bidirectional.
6. Matching Transformers: Tap range matched to acoustical environment of speaker location.

E. Exit Marking Audible Notification Appliance:

1. Exit marking audible notification appliances shall meet the audibility requirements in NFPA 72.
2. Provide exit marking audible notification appliances at the entrance to all building exits.
3. Provide exit marking audible notification appliances at the entrance to areas of refuge with audible signals distinct from those used for building exit marking

2.11 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

1. Connect new equipment to existing control panel in existing part of the building.
2. Connect new equipment to existing monitoring equipment at the supervising station.
3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to the new points. New components shall be

capable of merging with existing configuration without degrading the performance of either system.

C. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

D. Smoke- or Heat-Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A or Annex B in NFPA 72.
5. HVAC: Locate detectors not closer than 60 inches from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

E. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

F. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

G. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
1. Alarm-initiating connection to elevator recall system and components.
2. Supervisory connections at valve supervisory switches.
3. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.
    a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 31 1000
SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMNETS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Protecting existing trees and vegetation to remain.
   2. Removing trees and other vegetation.
   3. Clearing and grubbing.
   4. Topsoil stripping.
   5. Removing above-grade site improvements.
   6. Disconnecting, capping or sealing, and abandoning site utilities in place.
   7. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections include the following:
   1. Division 1 Section "Execution Requirements" for surveying utility locations and for recording field measurements.
   2. Division 1 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
   3. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
   4. Division 2 Section "Landscape Work" for finish grading, including placing and preparing topsoil for lawns and planting.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

B. SUBMITTALS

C. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

D. Record drawings according to Division 1 Section “Closeout Procedures."
   1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.5 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.

B. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Notify utility locator service for area where Project is located before site clearing.

D. Traffic. Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations per applicable Highway Permits, Division 01 General Requirements, and Drawings.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage Parking vehicles or equipment.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section 31 2000 – Earth Moving- Site.

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

E. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in

a manner approved by Owner's Representative.

1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

A. Locate, identify, excavate disconnect, and seal or cap off utilities indicated to be removed.
   1. Review existing survey for indicated utilities.
   2. Review with Owner's representative for additional information and verification.
   3. Arrange to shut off indicated utilities with utility companies.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's Representative written permission. Refer to Section 31 2000 – Earth Moving Site

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
   3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
   4. Use only hand methods for grubbing within drip line of remaining trees.
   5. Chip removed tree branches and dispose of off-site.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
   1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Top soil material shall be screened to be 1" minus and stockpiled onsite. Topsoil shall be in accordance with Section 2.2 of Turfs and Grasses Section 32 92 00.

D. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Limit height of topsoil stockpiles to ten feet.
   2. Do not stockpile topsoil within drip line of remaining trees.
   3. Dispose of excess topsoil as specified for waste material disposal.
   4. Stockpile surplus topsoil and allow for respreading deeper topsoil. Stockpile ares on site is limited. If required stockpile off site.

3.6 SITE IMPROVEMENTS

A. Remove existing above and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement in straight line to remain before removing existing pavement. Saw-cut full depth faces vertically.

3.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 31 2000 EARTH MOVING - SITE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 01 50 00 Temporary Facilities and Controls apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for curbs, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for stormwater practices and utility structures.
3. Subbase course for concrete walks and pavements.
4. Excavating and backfilling trenches for buried utilities and pits for buried utility structures.
5. Excavation for mass grading of site.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Geotechnical Engineer.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Geotechnical Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

1. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) in place that cannot be removed by

rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, or ripping. Excavation of Trenches and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89-kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 18,700 lbf (83 kN); measured according to SAE J-1179.

2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp (157- kW) flywheel power and developing a minimum of 45,000-lbf (200-kN) breakout force; measured according to SAE J-732.

F. Structures: Slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subbase Course: Layer placed between the subgrade and asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

I. Utilities: include on-site underground pipes, conduits, ducts, and cables, as well as underground services within 5 feet of the building.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of detectable warning tape.
2. Drainage fabric.
3. Separation fabric.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be re- moved. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not avail- able from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting the requirements of NYSDOT Item # 304.12.

F. Structual Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Crushed Stone: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; meeting the requirements of NYSDOT Item # 623.12 and gradation requirements of NYSDOT Item # 605.0901.

I. Rip Rap: Medium stone fill of crushed or uncrushed rock meeting the requirements of NYSDOT Item # 620.04, unless otherwise specified on the Drawings.

J. Bank Run Gravel: Naturally graded mixture of natural sand or sand and gravel, meeting ASTMD 2487 Soil Classification Groups GW, GP, or GM (Gravelly Soils), or SW, SP, or SM (Sandy Soils).

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.

C. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum proper- ties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and waterways.

3.2 DEWATERING

A. Provide in accordance with Section 01 50 00 Temporary Facilities and Controls.

3.3 EXCAVATION, GENERAL

A. Classified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Equipment Pads: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or mi- nus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe per project plans and details.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: As indicated on construction plans.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat- bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench

to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.

3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 APPROVAL OF SUBGRADE

A. Notify Geotechnical Engineer when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings as directed by structural and geotechnical engineer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Geotechnical Engineer.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to pre- vent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Soil material shall be screened to be 3” minus and stockpiled on site. Soil material shall be in accordance with section 2.1 of Earth Moving 31 20 00.
3. Top soil material shall be screened to be 1” minus and stockpiled onsite. Topsoil shall be in accordance with Section 2.2 of Turfs and Grasses Section 32 92 00.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation as specified on construction plans.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.
4. Removing concrete formwork.

5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fit- tings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Coordinate backfilling with utilities testing.

E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is re- moved.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 18 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal, so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 12 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under utility structures and paved shoulders, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 92 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below sub-grade and compact each layer of backfill or fill material at 90 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

3.16 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase.
2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 92 percent of maximum dry unit weight according to ASTM D 1557.
3. Shape subbase and base to required crown elevations and cross-slope grades.
4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 FIELD QUALITY CONTROL

A. Geotechnical Special Inspector: Owner shall engage a qualified independent geotechnical engineering special inspection agency to perform field quality-control testing.

B. Allow Geotechnical Special Inspector to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Geotechnical Special Inspector will test compaction of soils in place according to ASTM D 6938. Tests will be performed at the following locations and frequencies:

1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area, but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.

D. When the Geotechnical Special Inspector reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and

recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, back- fill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil offsite.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it offsite per 6 NYCRR 360.

END OF SECTION 31 2000

SECTION 31 2316
EXCAVATION - BUILDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Removals.

B. Excavating and backfilling for footings, slabs-on-grade, and paving.

C. Dewatering.

D. Temporary excavation support and protection systems.

E. Preparing subgrades for footings, pavements, concrete stairs, and seeded areas.

F. Drainage course for footings, pavements, and concrete stairs.

G. Subbase course for concrete footings, pavements, concrete stairs, trenches, and seeded areas.

H. Final grading

1.3 RELATED REQUIREMENTS

A. Section 01 7000 - Execution: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 32 1313 - Concrete Paving.

1.4 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: For the following:
   1. Each type of fill material.

C. Material Test Reports: From a qualified Geo-technical Special Inspector indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curves according to ASTM D1557 for each on-site or borrow soil material proposed for fill and backfill.
   3. Optimum moisture-maximum density curve for each soil material.

D. Pre excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State of New York.

B. Shoring Installer Qualifications: Company specializing in performing the shoring and bracing work of this section with minimum five (5) years of documented experience.

1.7 DEFINITIONS

A. The following terms have the meanings ascribed to them in this Article, wherever they appear in this Section.

B. Excavation: Removal of material encountered above subgrade elevations.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Geo-technical Special Inspector. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the work.

C. Excavation is "earth excavation" and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered, pavements and other obstructions visible on ground surface, underground structures, utilities and other items indicated to be demolished and removed, together with earth and other materials, excluding rock.

D. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface

E. Subgrade Surface: Surface upon which subbase or topsoil is placed

F. 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.

G. Maximum Density: The dry unit weight in pounds per cubic foot of the soil at “Optimum Moisture Content” when determined by ASTM D 1557.

H. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

I. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

J. Drainage Fill: Layer supporting concrete pavement and stairs used to minimize capillary flow of pore water.

K. Fill: Soil materials used to raise existing grades. See 3.17.

L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

M. Unauthorized Excavation: The removal of material below required elevation indicated on the Drawings or beyond lateral dimensions indicated or specified without specific written direction by the Consruction Manager.

N. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.8 QUALITY ASSURANCE

A. Geotechnical Special Inspector Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Section 01 3000 - Administrative Requirements for Project Meetings.

1. Before commencing earthwork, meet with Consruction Manager, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

C. Codes and Standards: Perform earthwork complying with requirements of State New York Uniform Fire and Building Code and authorities having jurisdiction.

D. Testing and Inspection Service: Owner will employ and pay for a qualified independent geotechnical special inspection company to perform soil testing and inspection service during earthwork operations to include but not be limited to the following:
   1. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
      a. Field reports; in-place soil density tests or visual inspection of the sub-grade.
      b. One optimum moisture-maximum density curve for each type of soil encountered.
      c. Inspections and certifications shall be performed by a licensed engineer registered in the State of New York.

1.9 PROJECT CONDITIONS

A. Verify existing grades and notify Construction Manager of differing conditions.

B. Verify that survey bench mark and intended elevations for the Work are as indicated.

C. Project Site Information: A geotechnical report has been prepared for this Project and is available for information only. The report is appendixes to Division 1 of the Contract Documents. The opinions expressed in this report are those of the geotechnical engineer and represent interpretations of the subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Construction Manager and then only after arranging to provide temporary utility services have been provided.
   1. Notify Construction Manager not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Construction Manager's written permission.

E. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 PRODUCTS -

2.1 SOIL MATERIALS

A. Excavations General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Backfill and Fill: Satisfactory soil materials.
   1. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
   2. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
   3. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

C. Subbase: 3/4" clean gravel.

D. Select Fill: Naturally or artificially graded mixture of natural or crushed sand free of debris and organic matter. See the Geo-Technical Report for the required sizes and values for "Sieve" and "Percent Passing"

E. Drainage Fill: Clean 3/4" gravel.

F. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

G. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a very stiff state.

2.2 SHEETING, SHORING, AND BRACING

A. Steel Sheetpiling: Continuous interlock type complete with all required accessories, complying with ASTM A 328 or ASTM A 572.

1. Furnish steel sheetpiling of design, configuration, and length to resist pressure of earth to be retained.

PART 3 EXECUTION

3.1 TOPSOIL STRIPPING AND STOCKPILING

A. Stockpile approved topsoil where directed by the Construction Manager until required for use. Place, grade, and shape stockpiles for proper drainage.
   1. Topsoil will be tested prior to stockpiling. Stockpile only quantities of topsoil approved in writing for re-use.

3.2 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.3 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect existing structures, sidewalks, and paving from excavating equipment and vehicular traffic.

C. Protect lawns and other features to remain.

D. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Construction Manager.

E. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

F. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

G. Provide and maintain 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.

3.4 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA’s Excavation Standard, 29 CFR 1926, Subpart P.
   1. Excavations in stable rock or in less than 5 feet (1.5 m) in depth in ground judged as having no cave-in potential do not require excavation support and protection systems.

B. Excavation support and protection systems not required to remain in place shall be removed subject to approval of Brewster Central School District or Brewster Central School District's Representative.
   1. Remove temporary shoring and bracing in a manner to avoid harmful disturbance to underlying soils and damage to buildings, structures, pavements, facilities and utilities.

3.5 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrade, and from flooding Project site, and surrounding area.

B. The General Construction Contractor Contract # 1, shall provide, maintain and operate pumps of adequate capacity required to maintain excavations, pits, trenches and depressions within the Contract Limit Lines as well as the Buildings free of water accumulated at any time and as necessary to permit the proper installation of the work required under all contracts. Disposal of pumped water shall be done with due respect to the rights of adjoining buildings. All costs in connection with the removal of water as above provided for shall be borne by the General Construction Contractor

3.6 EXPLOSIVES

A. Explosives: Do not use explosives.

3.7 EXCAVATING GENERAL

A. Underpin adjacent structures that could be damaged by excavating work.

B. Excavate to accommodate new structures and construction operations.
   1. Excavate to the specified elevations.
   2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.

C. Hand trim excavations. Remove loose matter.

D. Notify Construction Manager of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

E. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

F. Do not interfere with 45 degree bearing splay of foundations.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard (0.25 cu m) measured by volume.

H. Provide temporary means and methods, as required, to remove all water from excavations until directed by Construction Manager. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

I. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

J. Remove excavated material that is unsuitable for re-use from site.

K. Stockpile excavated material to be re-used in area designated on site .
   1. Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion

L. Remove excess excavated material from site.

3.8 SUBGRADE PREPARATION

3.9 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

3.10 CLASSIFIED EXCAVATION

A. Excavation for this project shall be "classified" earth.

B. Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, soil materials, and obstructions, excluding rock

C. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials. Backfill removed from existing building foundation is not suitable for backfilling and shall not be used.

D. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
   1. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

E. Bottom of these excavations shall be provided with 12” of compacted drainage fill for footings and piers and 6” for manholes to eliminate differential settlement..

F. Pipes and conduits shall be provided with 6” of Pipe Zone Bedding material to eliminate differential settlement.

3.11 STABILITY OF EXCAVATIONS

A. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace, where sloping is not possible because of space restrictions or stability of material excavated, to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

B. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

C. Provide permanent steel sheet piling or pressure-creosote timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2--6" below final grade and leave permanently in place.

3.12 EXCAVATION FOR STRUCTURES

A. Remove existing structures as indicated.

B. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. When rock is encountered, remove additional 12” of material and provide compacted select fill to eliminate differential settlement.
2. Footing adjacent to existing building shall bear at same elevation or deeper. See specifications referencing Underpinning.

3.13 EXCAVATION FOR WALKS AND PAVEMENTS

A. Construct to indicated cross sections, elevations, and grades.

3.14 SUBGRADE INSPECTION

A. Notify Geo-technical Special Inspector and Construction Manager when excavations have reached required subgrade.

B. If Geo-technical Special Inspector determines that unsatisfactory soil is present, notify the Construction Manager prior to proceeding. At the direction of the Testing Laboratory and Construction Manager, continue excavation and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

3.15 UNAUTHORIZED EXCAVATION

A. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Construction Manager, without additional compensation.

3.16 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation as shown on drawings.
2. Removing concrete formwork.
3. Removing trash and debris.
4. Removing temporary shoring, bracing, and sheeting.
5. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

C. Place backfill and fill materials in layers not more than twelve inches thick in loose depth unless otherwise specified. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or covered with ice.

1. Place fill and backfill against foundation walls, and in confined areas such as trenches not easily accessible by larger compaction equipment, in maximum six inch thick loose depth layers.

3.17 FILL

A. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use select fill or satisfactory soil material.
   4. Under building footings, foundations and slabs on grade, use select fill or satisfactory soil material.

B. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.18 COMPACTION OF BACKFILLS AND FILLS

A. All materials with exception of open graded stone

B. Compact each layer of fill and backfill for the following area classifications to the percentage of maximum density specified below and at a moisture content suitable to obtain the required densities, but at not less than three percent drier or more than two percent wetter than the optimum content as determined by ASTM D 1557 (Modified Proctor).
   1. Landscaped Areas: Use satisfactory soil material. 90 percent.
   2. Under steps, ramps, walks and pavements: Use satisfactory soil material. 92 percent
   3. Under building footings, foundations and slabs on grade. Use select fill. 95 percent.

C. Maximum Modified Density requirements are in the Geo-technical Report.

D. When the existing ground surface to be compacted has a density less than that specified for the particular area classification, break up and pulverize, and moisture condition to facilitate compaction to the required percentage of maximum density.

E. Place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by compaction equipment, **and not more than 4 inches in loose depth for material compacted by hand-operated tampers.**

F. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

G. If a compacted layer fails to meet the specified percentage of maximum density, the layer will be recompacted and retested. If compaction cannot be achieved the material/layer will be removed and replaced. No additional material may be placed over a compacted layer until the specified density is achieved.

3.19 GRADING

A. Exterior Grading: Trim and grade area within the Grading Limit Line and excavations outside the limit line, required by this Contract, to a level of 4 inches below the finish grades indicated unless otherwise specified herein or where greater depths are indicated. Provide smooth uniform transition to adjacent areas.
   1. Landscaped Areas: Provide uniform subgrade surface within 1 inch of required level to receive topsoil thickness specified. Compact fill as specified to within three inches of subgrade surface. Remove objectionable material detrimental to proper compaction or to placing full depth of topsoil. If the top three inches of subgrade has become compacted before placement of topsoil, harrow or otherwise loosen rough graded surface to receive topsoil to a depth of three inches immediately prior to placing topsoil.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
   3. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
      a. Lawn or Unpaved Areas: Plus or minus 1 inch .
      b. Walks: Plus or minus 1/2 inch .
      c. Pavements: Plus or minus 1/2 inch .

3.20 FINISH GRADING

A. Before Finish Grading:
   1. Verify subgrade has been contoured and compacted.
   2. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove soil contaminated with petroleum products.
   3. Where topsoil is to be placed, scarify surface to depth of 3 inches (75 mm).
   4. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).

3.21 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. Walks: Shape the surface of areas under walks to required line, grade and cross section, with the finish surface not more than 1 inch above or below the required subgrade surface elevation

C. Under pavements and walks, place subbase course on prepared subgrade and as follows:
   1. Shape the surface of areas under pavement to required line, grade and cross section, with the finish surface not more than 1/2 inch above or below the required subgrade surface elevation
   2. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
   3. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches thick when compacted.
   4. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557

D. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

E. Thoroughly compact subgrade surface for walks and pavement by mechanical rolling, tamping, or with vibratory equipment as approved to the density specified.

3.22 DRAINAGE FILL

A. Under slabs-on-grade and stairs place drainage course on prepared subgrade and as follows:
   1. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
   2. Compact each layer of drainage course to required cross sections and in maximum 12" lifts of drainage material.

3.23 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Geo-technical Special Inspector: The Owner will engage a qualified independent geotechnical special inspection company to perform field quality-control testing.

C. Allow Geo-technical Special Inspector to inspect and test the following:
   1. Confirmation of existing structure, foundation bearing materials and extent of unsuitable material.
   2. Compaction of in place soil.
   3. Supply and compaction of select fill.
   4. Subgrade and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

D. Geo-technical Special Inspector will test compaction of soils in place according to ASTM D 6938 Tests will be performed at the following locations and frequencies:
   1. Footing Subgrade:Where footing sub grades consist of select fill or backfill or fill at least one test shall be performed to verify compaction is in accordance with the specifications.

2. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.

E. When the geo-technical special inspector reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.24 CLEANING

A. Remove excavated material that is unsuitable for re-use as acceptable fill from site.

B. Remove excess excavated material from site.

3.25 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

F. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

G. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

H. Scarify or remove and replace soil material to depth as directed by Geo-technical Special Inspector; reshape and recompact.

I. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

J. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.26 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove ALL surplus soils and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 31-2319 DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dewatering system.
2. Surface water control system.
3. System operation and maintenance.
4. Water disposal.

B. Related Requirements:

1. Available Project Information: Subsurface investigation report, indicating boring logs, soil profiles, ground water levels.

2. Contractor to coordinate and gain approval from the site engineer for discharge locations for dewatering operations during demolition operations.

1.2 DEFINITIONS

A. Dewatering:

1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations.
2. Disposing of removed water.

B. Surface Water Control: The removal of surface water within open excavations.

1.3 COORDINATION

A. Coordinate Work of this Section to permit following construction operations to be completed on dry and stable substrate:

1. Excavation for structures as specified in Section 31 20 00 – Earth Moving-Site.

1.4 SEQUENCING

A. Sequence Work of this Section to obtain required permits before start of dewatering operations. Contractor to procure approval of the site engineer for pump discharge locations prior to discharge.

1.5 SUBMITTALS

A. Product Data:

1. Submit sizes, capacities, priming method, and motor characteristics for dewatering pumps.
2. Submit pumping equipment for control of surface water within excavation.

B. Shop Drawings:

1. Indicate dewatering system layout, well depths, well screen lengths, dewatering pump locations, pipe sizes and capacities, grades, filter sand gradations, surface water control devices, valves, and water disposal method and location.
2. Indicate primary power system location and capacity.
3. Include detailed description of dewatering and monitoring system installation procedures and maintenance of equipment.
4. Include description of emergency procedures to follow when problems arise.

1.6 QUALITY ASSURANCE

A. Comply with the New York State Department of Environmental Conservation (NYSDEC) for following:

1. Water discharge and disposal from pumping operations.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Furnish dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.

B. Install sump pit to dewater and relieve hydrostatic pressure within the work area.

C. Standby Equipment:

1. Store at Site and ready for immediate use upon failure of dewatering equipment.

2.2 PERFORMANCE AND DESIGN CRITERIA

A. Design:

1. Lower water table within areas of excavation to permit Work to be completed on dry and stable subgrade.
2. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.
3. Prevent damage to adjacent properties, buildings, structures, utilities, and other facilities from construction operations.
4. Maintain stability of sides and bottoms of excavations.
5. Surface Water Control System: Collect and remove surface water and seepage entering excavation.

2.3 DEWATERING EQUIPMENT

A. Furnish dewatering equipment to appropriately dewater the work area during demolition if required due to site conditions in accordance with the project plans and requirements of the NYSDEC.

2.4 ACCESSORIES

A. Valves and Fittings: Furnish valves and fittings as required connect the pump to the discharge location.

B. Filtering materials to ensure that only water is pumped from the site to the discharge locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Utility Service Locator:
   1. Request that underground utilities be located and marked within and immediately surrounding the site.

3.2 PREPARATION

A. Protect existing adjacent buildings, structures, and improvements from damage that may be caused by dewatering operations.

3.3 DEWATERING SYSTEM

A. Install dewatering system according with project plans and requirements of the NYSDEC.

B. Locate system components to allow continuous dewatering operations without interfering with installation of permanent Work and existing public rights-of-way, sidewalks, and adjacent buildings, structures, and improvements.

C. Pumps:

   1. Install according to manufacturer instructions.
   2. Connect pumps to discharge location.
   3. Install valves to permit pump isolation.

3.4 SURFACE WATER CONTROL SYSTEM

A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area, as specified in Section 31 25 00 - Erosion and Sedimentation Control.

B. Divert surface water and seepage water within excavation areas into sumps and pump water into locations approved by the site engineer.

C. Control and remove unanticipated water seepage into excavation.

3.5 SYSTEM OPERATION AND MAINTENANCE

A. Operate dewatering system as needed to dewater excavations during the demolition project.

B. Dewatering operations to continue on an as needed basis until the time of the building construction commences, as necessary and in accordance with the requirements of the NYSDEC.

C. Monitoring:

1. Conduct daily observation of dewatering system and monitoring system.
2. Make required repairs and perform scheduled maintenance.

D. Start emergency generators at least twice each week to check operating condition.

E. System Failure:

1. If dewatering system cannot control water within excavation, notify Engineer and stop excavation Work.

F. Modify dewatering and surface water control systems if operation causes or threatens to cause damage to new construction, existing Site improvements, adjacent property, or adjacent water wells.

G. Correct unanticipated pressure conditions affecting dewatering system performance.

H. Do not discontinue dewatering operations without approval of Engineer.

3.6 WATER DISPOSAL

A. Site engineer to determine ultimate discharge location of the dewatering line.

3.7 SYSTEM REMOVAL

A. Remove dewatering and surface water control systems after dewatering operations are discontinued.

B. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

3.8 PROTECTION

A. Protect sump pits and dewatering equipment from damage by construction operations.

END OF SECTION 312319

SECTION 31 2333 TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes excavation and backfill as required for pipe installation or other construction in the trench, and removal and disposal of water, in accordance with the applicable provisions of Section 31 20 00 Earth Moving and Section 31 50 00 Excavation Support and Protection unless modified herein.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 EXCAVATION

A. The trench excavation shall be located as shown on the Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Bidding Documents.

B. Trenches shall be excavated to maintain the depths as shown on the Drawings or as specified for the type of pipe to be installed.

C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.

D. The minimum width of trench excavation shall be 12 inches on each side of the pipe hub.

E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required. No trench shall be left open over night unless an adequate road plan is provided.

F. Bridging across open trenches shall be constructed and maintained where required. Provide shop drawing of bridging or road plate system designed and stamped by NYS Licensed Professional Engineer.

3.2 SUBGRADE PREPARATION FOR PIPE

A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.

B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.

C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.

D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

3.3 STORAGE OF MATERIALS

A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits, Division 01 General Requirements, and Drawings.

B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.

1. The Contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.

C. If directed by the Engineer, the Contractor shall refill trenches with satisfactory soil materials or other suitable materials and excess excavated materials shall be disposed of offsite by the contractor.

3.4 REMOVAL OF WATER AND DRAINAGE

A. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the trench, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work.

B. The removal of water shall be in accordance Section 01 50 00 Temporary Facilities and Controls.

3.5 PIPE EMBEDMENT

A. All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe as laid.

B. Concrete cradle and encasement of the class specified shall be installed where and as shown on the Contract Drawings or ordered by the Engineer. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or flotation. The concrete cradle or encasement shall extend the full width of the trench as excavated unless otherwise authorized by the Engineer. Where concrete is to be placed in a sheeted trench it shall be poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

C. Embedment materials placed above the centerline of the pipe or above the concrete cradle to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

3.6 BACKFILL ABOVE EMBEDMENT

A. The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified.

1. The trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted per Section 31 20 00 Earth Moving.

2. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment.

B. Backfilling of trenches beneath, across or adjacent to drainage ditches and water courses shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches and the backfill shall be protected from surface erosion by adequate means.

1. Where trenches cross waterways, the backfill surface exposed on the bottom and slopes thereof shall be protected by means of stone or concrete rip-rap or pavement.

C. All settlement of the backfill shall be refilled and compacted as it occurs.

D. Temporary pavement shall be placed as required by the Highway Work Permits and all Laws and Regulations.

END OF SECTION 31 2333

SECTION 31 5000
EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Division 01 General Requirements apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.3 PERFORMANCE REQUIREMENTS

A. Design, provide, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
   1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
   2. Prevent surface water from entering excavations per Division 01 General Requirements.
   3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
   4. Monitor vibrations, settlements, and movements.

1.4 SUBMITTALS

A. Shop Drawings: For excavation support and protection system.

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Other Informational Submittals:
   1. Existing Conditions: per Division 01 Requirements.
   2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.
   3. Note locations and capping depth of wells and well points.

1.5 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Pre-installation Conference: Conduct a pre-installation conference per Division 01 General Requirements.
   1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:
      a. Geotechnical report.
      b. Existing utilities and subsurface conditions.
      c. Proposed excavations.
      d. Proposed equipment.
      e. Monitoring of excavation support and protection system.
      f. Working area location and stability.
      g. Coordination with waterproofing.
      h. Abandonment or removal of excavation support and protection system.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

B. Notify Engineer and Owner no fewer than two days in advance of proposed interruption of utility.

C. Do not proceed with interruption of utility without Owner's/Engineer's written permission.

D. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

E. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

D. Corners: Site-fabricated mechanical interlock or Roll-formed corner shape with continuous interlock.

E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

F. Tiebacks: Steel bars, ASTM A 722/A 722M.

G. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.
2. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
3. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
4. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.
5. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

B. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches (1500 mm). Accurately align exposed faces of sheet piling to vary not more than 2 inches (50 mm) from ahorizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 UNDERPINNING

A. Excavate as required for placing underpinning in alternate sections not exceeding 2'-0" in width and to depths required to install the concrete Work as shown. If not otherwise shown carry the underpinning down to the level of the footings of the new construction. Alternate sections of concrete underpinning shall be in place supporting the superimposed loads properly before adjacent sections of earth are excavated.

B. Provide approved shoring as required to prevent damage to existing Work until the under pinning is complete and in condition to support the structure.

C. Install forms for exposed faces and at each end of each section of the concrete underpinning. No forms will be required for underpinning in contact with existing Work.

D. Roughen and clean existing concrete surfaces that will be in contact with concrete underpinning. Wet such surfaces and then coat with neat cement grout. Place new concrete before the grout has attained its initial set.

E. Install concrete underpinning in alternate sections not exceeding 4'-0" in width and up to approximately 3 inches below the bottom of the existing foundations to be supported. Provide a 2 x 4 inch key type construction joint for full height of the concrete at each end of each section. After the underpinning has set for 24 hours, pack the void between the top of the underpinning and the existing Work full with stiff concrete solidly rammed in place.

F. Provide wedges, plates and beams to transfer the load of the structure to the underpinning if required to prevent settlement.

4.1 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.
   1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
   2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

4.2 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
   1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
   2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
   3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

4.3 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches (1200 mm) below overlaying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Section 31 20 00 Earth Moving.
3. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION

SECTION 32 1216
ASPHALT PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Aggregate base course.

B. Road Paving: Double course bituminous concrete paving.

C. Heavy Duty Road Paving: Double course bituminous concrete paving.

D. Walkway Paving: Single course bituminous concrete paving.

E. Asphalt Repairs.

F. Hot mix asphalt overlay.

G. Hot-mix asphalt patching.

H. Surface sealer.

1.3 RELATED REQUIREMENTS

A. Section 32 1313 - Concrete Paving.

1.4 REFERENCE STANDARDS

A. New York State Department of Transportation

B. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; 2015.

C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt
1. Pavements," unless more stringent requirements are indicated.

D. AI MS-19 - A Basic Asphalt Emulsion Manual; Fourth Edition.

1.5 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. Job-Mix Designs: For each job mix proposed for the Work.

D. Indicate, with international graphics symbol, spaces dedicated to people with disabilities

E. Shop Drawings: Pavement markings, lane separations, and defined parking spaces.

F. Samples: For each paving fabric, 12 by 12 inches minimum.

G. Qualification Data: For manufacturer.

H. Material Test Reports: For each paving material.

I. Material Certificates: For each paving material, signed by manufacturers.

1.6 QUALITY ASSURANCE

A. Manufacturer shall be a paving-mix manufacturer registered with and approved by the New York DOT.

B. Perform Work in accordance with State of New York Highways standard.

C. Mixing Plant: Complying with State of New York Highways standard.

D. Obtain materials from same source throughout.

1.7 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with SHA for asphalt paving work.

B. Conform to New York State and NY DOT code for paving work on public property.

1.8 FIELD CONDITIONS

A. Prime and Tack Coats: Minimum surface temperature of 60 deg F

B. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

C. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

D. Place bitumen mixture when temperature is not more than 15 F degrees (8 C degrees) below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Asphalt concrete and all related items shall meet the requirements of NYSDOT Section 400

B. Aggregate for Base Course shall be Type 4 and conform to the requirements of Section 304 of the NY State DOT Specifications.

1. Gradation shall conform to the following:

	Sieve Size Designation	Percent Passing by Weight
b.	3 inch	100%
c.	2 inch	90-100%
d.	1/4 inch	30-65%
e.	No. 40	5-40%
f.	No. 200	0-10%

C. Binder Course: Type 3, NYSDOT Sections 401, 403

D. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

F. Surface Course: Type 7F, NYSDOT Sections 401, 403

G. Primer: In accordance with State of New York Highways standards.

H. Tack Coat: In accordance with State of New York Highways standards 702-90.

I. Seal Coat: AI MS-19, slurry type.

2.2 ASPHALT PAVING MIXES AND MIX DESIGN

A. Refer to NYDOT Specification.

B. Submit proposed mix design of each class of mix for review prior to beginning of work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

D. Review condition of subgrade and preparatory work.

E. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

3.2 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct lay-down and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

D. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.

E. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

F. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

G. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

H. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

I. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

J. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.3 AGGREGATE BASE COURSE

A. Proof roll subbase surface with a ten (10) ton static steel wheel roller to check for unstable or otherwise unsuitable areas, as determined by the Architect. Replace and recompact all unsatisfactory areas, as approved by the Architect, prior to commencement of paving operations.

B. Construction of crushed stone base shall be in accordance with the applicable requirements of Section 304 of the New York State Department of Transportation Specifications and as required herein.

3.4 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 PREPARATION - TACK COAT

A. Apply tack coat in accordance with New York State Department of Transportation.

B. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.6 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Asphalt concrete shall not be applied on a wet surface or when the air temperature is below 45 degrees F. unless otherwise directed, or when weather conditions would prevent proper construction.

B. Install Work in accordance with State of New York Highways standards 400 unless otherwise specified..

C. Place asphalt on the same day as applying tack coat.

D. Place asphalt to compacted thickness noted on plans.

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.7 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place asphalt binder course to compacted thickness shown on plan.

C. Place asphalt wearing course within two hours of placing and compacting binder course.

D. Place asphalt wearing course to compacted thickness shown on plan.

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.8 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
   3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
   4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density

3.9 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
   1. Tack coat faces of excavation and allow to cure before paving.
   2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
   3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

C. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

D. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.
   1. Allow tack coat to cure undisturbed before paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.10 CURBS Refer to Section 32 1313

3.11 PAVEMENT MARKING Refer to Section 32 1723

3.12 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch (6 mm) measured with 10 foot (3 m) straight edge.

B. Compacted Thickness: Within 1/4 inch (6 mm) of specified or indicated thickness.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements

3.13 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.14 DISPOSAL

A. Except for material indicated to be recycled, if any, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

B. Do not allow excavated materials to accumulate on-site

3.15 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for three (3) days or until surface temperature is less than 140 degrees F (60 degrees C).

END OF SECTION

SECTION 32 1313 CAST IN PLACE CONCRETE-SITE

PART 1 - GENERAL

A. Drawings and Division 01 General Requirements apply to this section.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement the following:
1. Curbs.
2. Walkways.
3. Slabs-on-grade.
4. Seating Steps
5. Watermain concrete encasement.

B. Related Sections include other Division 2 Sections.

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. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.
9. Detectable warning strips.

D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

C. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I or II gray.

B. Normal-Weight Aggregates: ASTM C 33, Class [4S] [4M] coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Available Products:

a. Axim Concrete Technologies; Cimfilm.
b. Burke by Edeco; BurkeFilm.
c. ChemMasters; Spray-Film.
d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
e. Dayton Superior Corporation; Sure Film.
f. Euclid Chemical Company (The); Eucobar.
g. Kaufman Products, Inc.; Vapor Aid.
h. Lambert Corporation; Lambco Skin.
i. L&M Construction Chemicals, Inc.; E-Con.
j. MBT Protection and Repair, ChemRex Inc.; Confilm.
k. Meadows, W. R., Inc.; Sealtight Evapre.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
n. Sika Corporation, Inc.; SikaFilm.
o. Symons Corporation; Finishing Aid.
p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoko; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation; Resi-Chem Clear.
m. Tamms Industries Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
p. Tamms Industries, Inc.; Horncure 200-W.
q. Unitex; Hydro White.
r. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4,000 psi (20.7 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
3. Slump Limit: 4” (100 mm) plus or minus 1 inch (25 mm).

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use plasticizing and retarding admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.8 CONCRETE MIXING

PART 3 - Retain option in paragraph below if synthetic fibers are required.

PART 4 - Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

4.2 DETECTABLE WARNINGS

A. Manufactured from precast concrete, clay or polymer composite materials as approved by the Engineer

B. Color must contrast visually with adjacent walking surfaces (either light-on-dark or dark-on-light) per the US Department of Justice (DOJ) ADA Standards for Accessible Design, section 705.13.

C. Have a good appearance, free of cracks or other defects.

D. Have clean-cut and well-defined edges.

E. Be weather resistant and durable to normal pedestrian wear and maintenance activities.

F. Show no appreciable fading, lifting, or shrinkage.

G. Embedded into surrounding concrete.

H. Manufacturers
1. “Detectable Warning Paver” as manufactured by Hanover Architectural Products, Hanover, PA
2. “Armor-Tile Cast-in-Place Truncated Dome Systems” as manufactured by Engineered Plastics, Inc., Williamsville, NY,
3. “Polymer Wet-Set Detectable Warning Surface” manufactured by TufTile, Inc., Lake Zurich, IL,

PART 5 - EXECUTION

5.1 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 pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) require correction according to requirements in Section 31 20 00 "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

5.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

5.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

5.4 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. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

5.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 30 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

5.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement sections are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

5.7 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 with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

5.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

5.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

5.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports at contractor’s expense.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

5.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 1313

SECTION 32-1316.23 STAMPED CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Dry-shake colored hardener applied to exterior concrete paving surfaces as indicated on Drawings.
2. Stamping concrete patterns with special imprinting tools.
3. Curing of colored and imprinted concrete.

B. Related Sections:

1. Section 32 13 13 “Cast-In-Place Concrete” for general concrete applications.

1.2 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 301: Specification for Structural Concrete for Buildings.
2. ACI 302.1R: Recommended Practice for Concrete Floor and Slab Construction.
3. ACI 303.1: Standard Specification for Cast-in-Place Architectural Concrete.
4. ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete.
5. ACI 305R: Recommended Practice for Hot Weather Concreting.
6. ACI 306R: Recommended Practice for Cold Weather Concreting.

B. ASTM International (ASTM):

1. ASTM C 260: Standard Specification for Air Entraining Admixtures for Concrete.
2. ASTM C 309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
3. ASTM C 979: Standard Specification for Pigments for Integrally Colored Concrete.

C. Portland Cement Association (PCA):

1. PA124: Finishing Concrete with Color and Texture.

1.3 SUBMITTALS

A. Product Data: For the following products:

1. Dry-shake colored hardener
2. Antiquing release agent
3. Liquid release agent
4. Imprinting/Texturing tools

5. Curing compound and sealer

B. Design Mixes: For each type of concrete.

C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.

D. Qualification Data: For manufacturer and Installer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 years of documented experience producing the specified products.

B. Installer Qualifications: Minimum 5 years of documented experience with work of similar scope and complexity required by this Project and acceptable to, or certified by, stamped concrete paving manufacturer.

C. Publications: Comply with applicable requirements of ACI 301 and PCA PA124.

D. Material Source: Obtain each specified material from the same source.

E. Notification: Give a minimum 7 calendar days' notice to manufacturer's authorized field representative before date established for commencement of work.

For large projects or where color and appearance are critical, include provisions for a mockup to demonstrate finished appearance and workmanship standards.

F. Stamped Concrete Paving Mockups:

1. Construct a 10 foot by 10 foot mockup at location selected by Landscape Architect.
2. Provide individual mockups for each color and pattern required.
3. Construct mockup using materials, processes, and techniques required for the work, including curing procedures. Incorporate representative control, construction, and expansion joints according to Project requirements. Installer for the work to construct mockup.
4. Notify Architect and Owner a minimum of seven calendar days in advance of the date scheduled for each mockup construction.
5. Obtain the Architect's and Owner's acceptance of each mockup prior to commencement of the work.
6. Each mockup to remain until completion of the work to serve as a quality control standard for the work. Provide suitable protections to preclude damage to mockup.
7. Demolish and remove each mockup from site when directed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration date as applicable.

B. Store products in a location protected from damage, construction activity, and adverse environmental conditions according to manufacturer's current recommendations.

1. Imprinting tools must be stored flat, textured face up, with no objects resting on top.

C. Handle products according to manufacturer's printed instructions.

1.6 PROJECT CONDITIONS

A. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.

B. Do not place concrete if rain, frost, or snow is forecast within 24 hours of placement. Protect fresh concrete from moisture and freezing conditions.

C. Compliance Standards: ACI 305R and ACI 306R.

1.7 PREINSTALLATION CONFERENCE

A. Seven calendar days prior to scheduled date of concrete placement, conduct a meeting at Project site to discuss requirements, including application methods. Attendees to include Architect, Owner, Contractor, Installer, concrete supplier, and manufacturer's authorized field representative.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Provide products specified herein manufactured by Sika Corporation.

2.2 MATERIALS

A. Dry-Shake Colored Hardener: Cementitious material containing special hard aggregates, formulated as a high opacity color hardening material for the top surface of freshly place concrete substrates. Highly UV-resistant. Factory proportioned, mixed and packaged, ready-to-use. Comply with ASTM C 979.

1. Product: "LITHOCHROME Color Hardener", Sika Corporation.
2. Colors: U18 Gull Gray Base Color
3. Imprinting Tools: System of matched tools for imparting textures and patterns into freshly placed concrete surfaces.
4. Product: "LITHOTEX Pavecrafters", , Sika Corporation.
5. Patterns: 24" x 24" Bluestone.

B. Antiquing Release Agent: Colored, finely powdered material formulated to break the bond between imprinting tools and surface of color-hardened concrete while imparting an antiqued appearance.

1. Product: "LITHOCHROME Antiquing Release Pro", Sika Corporation.
2. Colors: R12 Storm Grey.

C. Liquid Release Agent: Colorless, scented liquid formulated to break the bond between imprinting tools and surface of color-hardened concrete. Evaporates completely, leaving no residue.

1. Product: “SCOFIELD Liquid Release BG”, Sika Corporation.

D. Waterborne Curing Compound and Sealer: Low VOC waterborne modified acrylic formulation. Complies with ASTM C 309.

1. Product: “SCOFIELD Cureseal-W”, Sika Corporation.

E. Solvent-Borne Curing Compound and Sealer: Complies with ASTM C 309.

1. Product: “SCOFIELD Cureseal 700”, Sika Corporation.
2. Product: “SCOFIELD Cureseal 350”, Sika Corporation.

2.3 CONCRETE MIX DESIGN

A. General: Refer to Section 32 13 13 “Cast in Place Concrete” for basic concrete requirements, including formwork, reinforcement, concrete materials, and mixing.

B. Minimum Cement Content: 5-1/2 sacks per cubic yard of concrete.

C. Mix design must not permit segregation of concrete materials during pumping, placing, or consolidation of concrete. Slump not to exceed 4 inches.

D. Admixtures:

1. A normal or retarded-set, water-reducing admixture is permissible.
2. An air-entraining admixture complying with ASTM C 260 is acceptable where freeze/thaw durability is required.
3. A nonchloride accelerator is acceptable for cold weather concrete placement.
4. Do not add a high-range water reducing admixture (superplasticizer).

E. Do not add calcium chloride to concrete mix.

F. Use of fly ash as a cement replacement may be acceptable, subject to manufacturer’s current recommendations.

G. Do not add water to the mix in the field.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Subgrade to receive stamped concrete paving work must be well drained and have adequate, uniform loadbearing characteristics.

1. Verify grading will ensure a uniform concrete thickness during concrete placement.

B. At the time of concrete placement, subgrade must be moist, completely consolidated, and free from frost. If necessary, subgrade may be dampened with water prior to placement; however, freestanding water or soft, muddy, or frozen ground in not permissible.

3.2 CONCRETE PLACEMENT

A. General: Place and spread concrete to completely fill all space inside forms. Move concrete into place with square-tipped shovels or concrete rakes.

B. Consolidate concrete by tamping or vibrating to provide a suitable surface for finishing.

C. Prior to appearance of excess moisture or bleed water, screed concrete with wood or magnesium straight edge or mechanical vibrating screed.

D. Continue concrete surface leveling and consolidation with highway magnesium straight edge and (or) magnesium bull float.

E. Mechanically float concrete surfaces to required flatness and levelness as soon as concrete surface has taken its initial set and will support weight of a power float machine equipped with float shoes or combination blades and operator.

1. Comply with ACI 302.1R for acceptable tolerances.

F. Completed concrete placement to result in an open surface suitable to receive colored hardener.

3.3 STAMPED CONCRETE PAVING INSTALLATION

A. Apply 2/3 of dry-shake colored hardener at specified application rate to freshly floated concrete surface. Bleed water must not be present during or following application of first and second dry-shake applications.

B. Do not throw dry-shake colored hardener material; distribute evenly by hand or mechanical spreader designed to apply floor hardeners. Mechanical spreader manufacturer as acceptable to stamped concrete paving manufacturer.

C. As soon as dry-shake material has absorbed moisture, indicated by uniform darkening of surface, mechanically float concrete surface a second time, just enough to bring moisture from base slab through dry-shake color hardener.

D. Immediately following second floating, apply remaining 1/3 of dry-shake colored hardener at specified application rate. If applied by hand, broadcast in opposite direction of first application for a more uniform coverage. If a mechanical spreader is used, apply in same manner as previously described.

E. As soon as dry-shake material has absorbed moisture, mechanically float concrete surface a third time.

F. Do not add water to the surface.

G. Begin imprinting operations immediately after applying dry-shake colored hardener, according to manufacturer’s written instructions, including application of powder antiquing release agent.

3.4 SEALING

A. Prior to sealing, the following conditions must be present:

1. Release agent has been removed.

2. Moisture content of concrete is low enough that alkali and other salts do not become trapped beneath sealer. This will require a minimum of 28 days subsequent to concrete placement, or longer if required.
3. No evidence of free water on concrete surfaces to receive curing and sealing compound.

B. Seal imprinted concrete with liquid membrane curing and sealing compounds as recommended by manufacturer.

C. Apply two coats of specified curing and sealing compound according to manufacturer's written instructions.

3.5 PROTECTION OF FINISHED WORK

A. Prohibit foot or vehicular traffic on the newly imprinted concrete surface.

B. Protect floor surface from damage throughout remainder of construction period until Final Acceptance of the work. If a covering material is necessary, surfaces must remain uncovered for a minimum of four days after which they may be covered with a new, smooth, nonstaining reinforced kraft curing paper. Plastic sheeting is unacceptable as a covering material.

3.6 SCHEDULE

A. Refer to Drawings for locations of stamped concrete paving applications.

END OF SECTION 32 1316.23

SECTION 32 1723.13
PAVEMENT MARKINGS

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 SECTION INCLUDES

A. Parking lot markings, including parking bays, arrows, handicapped symbols, curb markings, space numbers, and _____.

B. Roadway lane markings and crosswalk markings.

C. "No Parking" curb painting.

1.3 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls.

B. Section 01 7000 - Execution.

C. Section 32 1216 - Asphalt Paving.

D. Section 32 1313 - Concrete Paving.

E. Section 32 1726 - Tactile Warning Surfacing: Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

F. Reference Drawing - Site Safety Plan.

1.4 REFERENCE STANDARDS

A. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; 2007d (Validated 2017).

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons (18 L) accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MATERIALS

A. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; white.

1. Parking Lots: Yellow.

2. Handicapped Symbols: Blue.

B. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.

C. Reflective Glass Beads: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on); with silicone or other suitable waterproofing coating to ensure free flow.

D. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Obliteration of existing markings using paint is acceptable in lieu of removal; apply the black paint in as many coats as necessary to completely obliterate the existing markings.

D. Clean surfaces thoroughly prior to installation.

1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.

E. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

F. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

G. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.

1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
2. At Contractor's option, temporary marking tape may be used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Brewster Central School District.

3.3 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F (10 degrees C) or more than 95 degrees F (35 degrees C).

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch (0.4 mm), minimum.
   3. Length Tolerance: Plus or minus 3 inches (75 mm).
   4. Width Tolerance: Plus or minus 1/8 inch (3 mm).

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
   1. Conduct operations in such a manner that necessary traffic can move without hindrance.
   2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
   3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
   4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
   5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
   6. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate of 6 pounds per gallon (720 g per L) of paint; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.

H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.4 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Brewster Central School District.

END OF SECTION

SECTION 32 1726
TACTILE WARNING SURFACING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

1.3 RELATED REQUIREMENTS

A. Section 32 1216 - Asphalt Paving.

B. Section 32 1313 - Concrete Paving: Concrete sidewalks and ramps.

C. Section 32 1726 - Tactile Warning Surfacing: Crosswalk and curb markings.

1.4 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2016.

C. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2011.

D. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2014.

E. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

F. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.

G. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

H. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2016.

I. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

J. ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way; 2011.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data, standard details, details specific to this project; written installation and maintenance instructions.

C. Samples: For each product specified provide two samples, 8 inches (203 mm) square, minimum; show actual product, color, and patterns.

D. Shop Drawings: Submit plan and detail drawings. Indicate:
   1. Locations on project site. Demonstrate compliance with referenced accessibility standards.
   2. Sizes and layout.
   3. Pattern spacing and orientation.
   4. Attachment and fastener details, if applicable

E. Warranty: Submit manufacturer warranty; complete forms in Brewster Central School District's name and register with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience in the manufacturing of Cast In Place Detectable/Tactile Warning Surface Tiles.

B. Installer Qualifications: Company certified in writing by product manufacturer as having successfully completed work substantially similar to the work of this section.

C. Vitrified Polymer Composite (VPC) Cast In Place Detectable/Tactile Warning Surface Tiles shall be an epoxy polymer composition with an ultra violet stabilized coating employing aluminum oxide particles in the truncated domes. The tile shall incorporate an in-line pattern of truncated domes measuring nominal 0.2" height, 0.9" base diameter, and 0.45" top diameter, spaced center-to-center 2.35" as measured "In Line". For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 0.045" high, per square inch; "Armor-Tile" as manufactured by Engineered Plastics Inc., Tel: 800-682-2525, or approved equal.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.

B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F (4 and 32 degrees C).

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 TACTILE AND DETECTABLE WARNING DEVICES

A. Vitrified Polymer Composite (VPC) Cast In Place Detectable/Tactile Warning Surface Tiles shall be an epoxy polymer composition with an ultra violet stabilized coating employing aluminum oxide particles in the truncated domes. The tile shall incorporate an in-line pattern of truncated domes measuring nominal 0.2" height, 0.9" base diameter, and 0.45" top diameter, spaced center-to-center 2.35" as measured "In Line". For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 0.045" high, per square inch.

B. Dimensions: Cast In Place Detectable/Tactile Warning Surface Tiles shall be held within the following dimensions and tolerances:

1. Water Absorption: 0.05 percent, maximum, when tested in accordance with ASTM D570.
2. Slip Resistance: 0.50 minimum dry static coefficient of friction, when tested in accordance with ASTM D2047.
3. Compressive Strength: 28,000 pounds per square inch (- MPa), minimum, when tested in accordance with ASTM D695-02a.
4. Tensile Strength: 19,000 pounds per square inch (- MPa), minimum, when tested in accordance with ASTM D638-03.
5. Flexural Strength: 25,000 pounds per square inch (172 MPa) minimum, when tested in accordance with ASTM D790-03.
6. Chemical Stain Resistance: No reaction to and without discoloration or staining - 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel fuel and motor oil, when tested in accordance with ASTM D543-95.
7. Abrasive Wear of Tile when tested by BYK - Gardner Tester ASTM D 2486-00 with reciprocating linear motion of 37± cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallic sand paper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block is to be 3.2 lb. Average wear depth shall not exceed 0.060 after 1000 abrasion cycles when measured on the top surface of the dome representing the average of three measurement locations per sample.

8. Resistance to Wear of Unglazed Ceramic Tile by Taber Abrasion per ASTM C501-84 (re approved 2002) shall not be less than 500.
9. Gardner Impact to Geometry "GE" of the standard when tested by ASTM D 5420-04 to have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. lbf/in. A failure is noted when a crack is visible on either surface or when any brittle splitting is observed on the bottom plaque in the specimen
10. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System when tested to ASTM D 1037-99 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects.
11. Accelerated Weathering: Delta-E of less than 4.5 at 3,000 hours exposure, when tested in accordance with ASTM G155-05a,as well as no deterioration, fading or chalking of surface of tile color No 33538.
12. Loading: AASHTO HB-17 single wheel HS20-44 loading “Standard Specifications for Highways and Bridges”. The Cast In Place Tile shall be mounted on a concrete platform with a ½” airspace at the underside of the tile top plate then subjected to the specified maximum load of 10,400 lbs., corresponding to an 8000 lb individual wheel load and a 30% impact factor. The tile shall exhibit no visible damage at the maximum load of 10,400 lbs
13. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117-03.
14. Embedment flange spacing shall be no greater than 3.1” center to center spacing as illustrated on the product Cast In Place drawing
15. Installation Method: Cast in place replaceable.
16. Shape: Rectangular.
17. Dimensions: 24 inches by 36 inches (610 mm by 914 mm).
18. Color: FED-STD 595C, Table IV, Safety Red No. 31350. Color shall be homogeneous throughout the tile.
19. Products:
    a. Armor-Tile, a brand of Engineered Plastics, Inc; Cast in Place Tactile Panel for Transit: www.armortile.com.

2.2 ACCESSORIES

A. Fasteners: ASTM A666, Type 304 stainless steel
   1. Type: Countersunk, color matched composite sleeve anchors
   2. Size: 1/4 inch (6.35 mm) diameter and 1-1/2 inches (38 mm) long.

PART 3 EXECUTION

3.1 EXAMINATION

A. When installation location is near site boundary or property line, verify required location using property survey.

B. Verify that work area is ready to receive work:
   1. If existing conditions are not as required to properly complete the work of this section, notify Construction Manager.
   2. Do not proceed with installation until deficiencies in existing conditions have been corrected.

C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.2 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's written instructions.
   1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.

2. Do not install when ambient or substrate temperature has been below 40 degrees F (4 degrees C) during the preceding 8 daylight hours.

B. Field Adjustment:
1. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.
2. Orient so dome pattern is aligned with the direction of ramp.
3. Align truncated dome pattern between adjacent units.

C. Install units fully seated to substrate, square to straight edges and flat to required slope.

3.3 INSTALLATION, CAST IN PLACE PLASTIC TILES

A. Concrete:
1. See Section 03 3000.

B. When installing multiple adjacent units, leave a 3/16 inch (5 mm) gap between units to allow for expansion.

C. Tamp and vibrate units as recommended by manufacturer.

D. Place and position weights on units while concrete cures as recommended by manufacturer. Ensure no voids or air pockets exist between top surface of concrete and underside of units.

E. During Cast In Place Detectable/Tactile Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

F. Prior to placement of the Cast In Place Detectable/Tactile Warning Surface Tile system, review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Engineer.

G. The physical characteristics of the concrete shall be consistent with Section 32 1313 - Concrete Paving. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25 lb) shall be placed on each tile.

H. The concrete pouring and finishing operations require typical mason’s tools, however, a 4’ long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast In Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.

I. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.

J. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.

K. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast In Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes

L. In cold weather climates it is recommended that the Cast In Place Detectable/Tactile Warning Surface Tiles be set deeper such that the top of domes are level to the adjacent concrete on the top and sides of

ramp and that the base of domes to allow water drainage. This installation will reduce the possibility of damage due to snow clearing operations.

M. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb so that no ponding is possible on the tile at the back side of curb.

N. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile. L. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external forces placed on the tile that may rock the tile causing a void between the underside of tile and concrete.

O. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.

P. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.

Q. Individual tiles to be bolted together using ¼ inch or equivalent hardware. This will ensure that adjacent tiles are flush to each other during the installation process. Use tape or caulking on the underside of the bolted butt joint to ensure that concrete does not rise up between the tiles during installation. Any protective plastic wrap which was peeled back to facilitate bolting or cutting, should be replaced and taped to ensure that the tile surface remains free of concrete during the installation process.

R. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.

S. Any sound-amplifying plates on the underside of the tile, which are dislodged during handling or cutting, should be replaced and secured with construction adhesive. The air gap created between these plates and the bottom of the tile is important in preserving the sound on cane audible properties of the Armor-Tile system as required in various jurisdictions.

3.4 CLEANING PLASTIC UNITS

A. Remove protective plastic sheeting within 24 hours of installation.

B. Remove excess sealant or adhesive from joints and edges.

C. Clean four days prior to date of scheduled inspection.

3.5 PROTECTION

A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.

B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION

SECTION 32 3113 CHAIN LINK FENCE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes fence framework, fabric, gates, steel posts and channels as shown on the Contract Drawings, complete with accessories.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)

a. A90 Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles

b. A121 Specification for Zinc-Coated (Galvanized) Steel Barbed Wire

c. A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric

d. A428 Test Method for Weight of Coating on Aluminum-Coated Iron or Steel Articles

e. A491 Specification for Aluminum-Coated Steel Chain-Link Fence Fabric

f. A569 Specification for Steel, Sheet and Strip, Carbon (0.15 Maximum Percent). Hot-Rolled, Commercial Quality

g. A585 Specification for Aluminum-Coated Steel Barbed Wire

h. A817 Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric

i. A824 Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain-Link Fence

j. B117 Method of Salt Spray (Fog) Testing

k. C94 Ready-Mixed Concrete

l. F567 Standard Practice for Installation of Chain-Link Fence

m. F626 Specification for Fence Fittings

n. F669 Standard Specification for Strength Requirements of Metal Posts and Rails

o. F083 Standard Specification for Pipe, Steel and Hot Dipped Zinc Coated, Welded, for Fence Structures

1.3 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Manufacturers certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification.

B. Samples of any material shall be submitted at the Engineers request.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are named to establish a standard of quality necessary for the Project.

1. Allied Tube & Conduit Corp.
2. Anchor Fence, Inc.
3. Page Aluminized Steel Corp.
4. Or equal

2.2 GENERAL

A. Framework: Type I or Type II Steel Pipe.

1. Type I - Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to Standard Specification ASTM F1083; or

2. Type II - pipe manufactured from steel conforming to ASTM A 569 or F 669, cold-formed, high frequency welded and having a minimum yield strength of 50,000 PSI. External surface triple coated with 1.0 ounce +- 0.1 ounce of zinc per square foot, 30 +- 15 micrograms of chromate per square inch and 0.5 +- 0.2 mils of clear, cross linked polyurethane. Internal surface coated, after welding, with a zinc-rich based organic coating having an 87% zinc powder loading capable of providing galvanic protection.

3. Pipe shall be straight, true to section and conform to the following weights:

Pipe Size Outside Diameter	Type I Weight Lbs./Ft.	Type II Weight Lbs./Ft.
1 5/8"	2.27	1.84
2"	2.72	2.28
2 1/2"	3.65	3.12
3"	5.79	4.64
3 1/2"	7.58	5.71
4"	9.11	6.56

4. Channel shall be Unistrut, model P1001A, 1 ⅝” x 3 ¼”, 12 ga. galvanized steel channel, or approved equal.

B. Fittings:

1. Pressed steel or cast iron, galvanized with a minimum of 1.2 ounces of zinc per square foot of surface area, or cast aluminum alloy, all conforming to ASTM F 626.

2.3 CONCRETE MIX

A. ASTM C 94 Portland Cement concrete with maximum 3/4" aggregate having a minimum compressive strength of 2,500 PSI at 28 days.

2.4 MATERIALS AND CONSTRUCTION

A. Fence Posts

1. Fence posts shall be 3.5” O.D.

B. Gate and Electric Equipment Mounting Posts

1. Gate and electric equipment mounting posts shall be sized as follows:

Single Gate Width	Double Gate Width	Post O.D. Type I	Type II
Up to 6'	Up to 12’	4"	3”
7' to 12'	13' to 25'	4"	3.5"
13' to 18'	25' to 36'	6 5/8"	---
Electrical Equipment Mounting Span			
Up to 5'		4"	4"

C. Rails and Braces

1. Rails and braces shall be 1.66" O.D.

D. Fabric

1. Fabric shall be black vinyl-coated steel wire, 9 gage, woven in a 2-inch diamond mesh with top knuckled selvage twisted and barbed and bottom selvage knuckled. Fence heights up to 12 feet shall be one-piece widths.

E. Gates

1. Gates shall have frame assembly of 2 inches O.D., Type I or Type II pipe with welded joints. Weld areas repaired with zinc-rich coating applied per manufacturer's directions. Fabric shall match fence. Gate accessories, hinges, latches, center stops, keepers and necessary hardware shall be of quality required for industrial and commercial application. Latches shall permit padlocking of gate.

F. Channels

1. Channel shall be Unistrut, model P1001A, 1 ⅝" x 3 ¼", 12 ga. galvanized steel channel, or approved equal.

G. Fittings

1. Post caps shall be pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply cone type caps for terminal posts and loop type for line posts.

2. Rail and brace ends shall be pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.

3. Top rail sleeves shall be tubular steel, 0.051 thickness by 7 inches long, expansion type.

4. Tension bars shall be steel strip, 5/8 inch wide by 3/16 inch thick.

5. Tension bands shall be pressed steel, 14 gage thickness by 2 inch wide.

6. Brace bands shall be pressed steel, 12 gage thickness by 2 inch wide.

7. Truss rods shall be steel rod, 3/8 inch diameter merchant quality with turnbuckle.

8. Channel mounting bolts shall be hot dip galvanized meeting ASTM F 1554, Grade 36, with nuts meeting ASTM A563 and flat washers.

G. Tension Wire

1. Tension wire shall be marcelled 6 gage steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A 824.

H. Tie Wires

1. Tie wires shall be aluminum 6 gage, alloy 1100-H4, A58 self locking fabric bands or equal.

I. Hog Rings

1. Hog rings shall be steel wire, 11 gage with a minimum zinc coating of 0.80 ounces per square foot of wire surface.

J. Privacy Slats

1. Privacy slats shall be High -Density Polyethylene (HDPE), color green, with a blocking percentage of 88%, and will include locking channels and all other attaching hardware.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fence installation shall conform to requirements of ASTM F 567.

B. Provide fence heights as shown on Contract Drawings.

C. Space line posts at intervals not exceeding ten feet.

D. Set terminal, gate and line posts plumb in concrete footings as shown on Contract Drawings. Top of footing shall be 2 inches above grade and sloped to direct water away from posts.

E. Brace gate and terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.

F. Install top rail through line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts. Fasten top rail to terminal posts.

G. Stretch bottom tension wire between terminal posts 6" above grade and fasten to outside of line posts with tie wires.

H. Pull fabric taut to provide a smooth uniform appearance, free from sag, with bottom selvage 2" above grade. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 18" intervals. Tie to line posts and top rails with tie wires spaced at maximum 14" on posts and 24" on rails. Attach to bottom tension wire with hog rings at maximum 24" intervals.

I. Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete. Adjust and lubricate hardware for smooth operation.

J. Install nuts for fittings, bands and hardware bolts on inside of fence. Peen ends of bolts or score threads to prevent removal.

END OF SECTION 32 3113

SECTION 32 3119
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Decorative steel fences.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2316 - Excavation - Building.

1.3 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 2100 - Allowances, for cash allowances affecting this section.

1.4 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

C. ASTM D523 - Test Method for Specular Gloss.

D. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

E. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

F. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

G. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

H. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

I. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

J. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

F. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines.

G. Manufacturer's Warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide manufacturer warranty for all structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

D. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Decorative Metal Fences and Gates:

1. The fence system shall conform to Montage II® Welded and Rackable (ATF – All Terrain Flexibility) Ornamental Steel, Majestic™, design, flush bottom rail treatment, 2-Rail,style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.2 MATERIAL

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.90 oz/ft2 (276 g/m2), Coating Designation G-90.

B. Material for pickets shall be 1” square x 14 Ga. tubing. The rails shall be steel channel, 1.75” x 1. 75” x .105”. Picket holes in the rail shall be spaced 4.715” o.c. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.3 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar’s proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

C. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be (specify Black or Bronze). The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

E. Swing gates shall be fabricated using 1.75" x 14ga Forerunner double channel rail, 2" sq. x 12ga. gate ends, and 1" sq. x 14ga. pickets. Gates that exceed 6' in width will have a 1.75" sq. x 14ga. intermediate upright. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gusset plates will be welded at each upright to rail intersection. Cable kits will be provided for additional trussing for all gates leaves over 6'.

F. Pedestrian swing gates shall be self-closing, having a gate leaf no larger than 48" width. Integrated hinge-closer set (2 qty) shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5" x 6" footprint). Hinge-closer set (2 qty) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (.5" - 1.375") and vertical (0 - .5"). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. Fence post shall be spaced according to manufacturers requirements, plus or minus ½". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

D. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

1. GATE INSTALLATION
    a. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.

3.3 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6.3 mm).

B. Maximum Offset From Indicated Position: 1 inch (25.4 mm).

C. Minimum Distance from Property Line: 6 inches (152 mm).

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Gates: Inspect for level, plumb, and alignment.

D. Workmanship: Verify neat installation free of defects.

3.5 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water rinse well.

C. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

D. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

3.7 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 32 9200 TURFS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 01 50 00 Temporary Facilities and Controls apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Seeding.
2. Meadow grasses and wildflowers.

B. Related Sections include Section 01 50 00 Temporary Facilities and Controls for Temporary Seeding.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

B. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.

C. Qualification Data: For landscape Installer.

D. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn and meadow establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

C. Pre-installation Conference: Conduct pre-installation conference at the Site per Division 01 General Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 SCHEDULING

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Planting: April 1 to September 15 or as approved by Engineer.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 60 days from date of Substantial Completion.

a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).
1. Water lawn at a minimum rate of 1 inch (25 mm) per week.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow grass 1 to 2 inches (25 to 50 mm) high.

E. Lawn Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to lawn area.

1.9 MEADOW MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than 40 days from date of Substantial Completion.

B. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch.

C. Watering: Provide lawn-watering equipment to convey water from sources and to keep meadow uniformly moist.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
2. Water meadow at a minimum rate of 1/2 inch (13 mm) per week for 6 weeks after planting.

PART 2 - PRODUCTS

2.1 SEED

A. Seed Species:

1. Seed Mix #1 (Lawn Areas)
   a. Provide seed mix at a rate of 100 pounds per acre containing the following mixture:
      1) Kentucky Bluegrass (20%).
      2) Creeping Red Fescue (40%).
      3) Perennial Ryegrass (20%).
      4) Annual Ryegrass (20%).
2. Seed Mix #2 (Slopes)
   a. For seeding cut and fill slopes along road and around parking area, for berms, backslopes and interior slopes of stormwater basins, to and all other disturbed areas not receiving other form of permanent stabilization or seed mix, at a rate of 60 lbs/acre: Native Steep Slopes w/ Annual Rye Grass Seed Mix (ERNMX-181) from Ernst Conservation Seeds of Meadville, PA
3. Seed Mix #3 (Basins)
   a. For bottoms of stormwater basins and for interior slopes and aquatic bench of pocket pond stormwater managment areas, at a rate of 30 lbs/acre: Retention Basin Floor Mix - Low Maintenance (ERNMX-126) from Ernst Conservation Seeds of Meadville, PA.

2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.

C. Aluminum Sulfate: Commercial grade, unadulterated.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through [3/4-inch (19-mm)] sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

B. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 PLANTING ACCESSORIES

A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.6 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.7 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.8 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: per Section 01 50 00 Temporary Facilities and Controls.

2.9 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with soil amendments and fertilizers recommended by the qualified soil testing laboratory.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 overspray.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

    a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

2. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow seed at the rate of 3 to 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

3.5 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.
2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre (15.3-kg/92.9 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.6 SATISFACTORY LAWNS

A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 MEADOW

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow seed at the net rate as recommended by manufacturer.

C. Brush seed into top 1/16 inch (1.6 mm) of topsoil, roll lightly, and water with fine spray.

D. Water newly planted areas and keep moist until meadow is established.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove erosion-control measures after grass establishment period.

END OF SECTION 32 9200

33 1400 WATER UTILITY TRANSMISSION AND DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements, Section 31 20 00 Earth Moving, Section 31 23 33 Trenching and Backfilling, and Section 31 50 00 Excavation Support and Protection.

1.2 SUMMARY

A. This Section includes piping and specialties for potable-water and fire-protection water service for the subdivision.

1.3 DEFINITIONS

A. The following are industry abbreviations for plastic and rubber materials:

1. DIP: Ductile Iron Pipe.
2. NP: Nylon.
3. PE: Polyethylene.
4. PP: Polypropylene.
5. PTFE: Polytetrafluoroethylene.
6. PVC: Polyvinyl chloride.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Pipe and fittings.
2. Flexible pipe fittings.
3. Valves.
4. Fire department connections.
5. Meter pit and appurtenances.

B. Record Drawings: per Division 01 General Requirements.

C. Test Reports: As specified in "Field Quality Control" Article in Part 3.

D. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.5 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Product Options: Drawings indicate size, and dimensional requirements of water- service piping specialties and are based on specific types and models indicated.

C. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.

D. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.

E. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," for materials, installations, tests, flushing, and valve and hydrant supervision.

F. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated devices.

G. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.

H. Listing and Labeling: Provide electrically operated specialties and devices specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 Requirements.

B. Preparation for Transport: Prepare valves according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

C. During Storage: Use precautions for valves according to the following:

1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.

2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

D. Handling: Use sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

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.

H. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Verify that water-service piping may be installed to comply with original design and referenced standards.

C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sleeves, and Corporation Stops:

    a. Ford Meter Box Co., Inc.
    b. Grinnell Corp.; Mueller Co.; Water Products Div.
    c. Lee Brass Co.

2. Gate Valves:

    a. Grinnell Corp.; Grinnell Supply Sales Co.
    b. Grinnell Corp.; Mueller Co.; Water Products Div.
    c. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)
    d. McWane, Inc.; Kennedy Valve Div.
    e. Nibco, Inc.
    f. Pratt: Henry Pratt Co.

2.2 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Tube: ASTM B 88 (ASTM B 88M), seamless water tube, annealed temper.

C. Ductile/PVC Plastic, AWWA C900, pressure class 200 with a DR not to exceed 14. Include elastomeric seal according to ASTM F 477.

D. Pipe shall be furnished in standard 20 foot lengths with no more than 15 percent furnished in random lengths exceeding 10 feet each.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11 “Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings”. Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50 “Thickness Design of Ductile-Iron Pipe” Class 54.

B. Restrained joint fittings and the restraining components shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 and/or C153/A21.53. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11.

C. Restrained joint pipe and fittings shall be Field Lok 350 gaskets.

D. Cement mortar lining and seal coating for pipe and fittings shall be in accordance with ANSI/AWWA C104/A21.4. Asphaltic outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 for fittings.

E. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 psi for sizes 4-inch through 24-inch.

F. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.

2.4 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.

C. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300, as required for system operating pressure.

D. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Units have 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections. Include 250-psig (1725-kPa) minimum working-pressure rating; epoxy, interior coating according to AWWA C550; length for offset and expansion indicated; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

E. Ductile-Iron, Deflection Fittings: Compound coupling fitting with sleeve and flexing sections, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include 250-psig (1725-kPa) minimum working-pressure rating; cement-mortar lining or epoxy, interior coating according to AWWA C550; deflection of at least 20 degrees (0.34 radians); and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

F. Ductile-Iron Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type; push-on- or mechanical-joint type. Include dimensions matching pipe, cement-mortar lining and seal coat according to AWWA C104, and rubber compression gaskets according to AWWA C111.

G. Mechanical joint restraining glands shall be “megalug 2000 PV” as manufactured by Ebaa Iron Sales, Inc. or approved equal.

2.5 PIPING SPECIALITIES

A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weldneck end types and matching piping system materials.

2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.

3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum pressure to suit system pressures.

4. 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 (1035- or 2070-kPa) minimum working pressure to suit system pressures.

5. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

6. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig (2070-kPa) working pressure at 225 deg F (107 deg C).

2.6 VALVES

A. Nonrising-Stem, Resilient-Seated Gate Valves, 3-Inch NPS (DN80) and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig (1380-kPa) minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.

B. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches (125 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.

C. Curb Stops: Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet to match service piping material.

D. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering “WATER”, and bottom section with base of size to fit over curb-stop and barrel approximately 3 inches (75 mm) in diameter.

1. Provide steel tee-handle shutoff rod with each service box. Include tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting curb-stop head.

E. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Include service clamp and stop compatible with drilling machine.

1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.

2. Corporation Stops: Bronze body and ground-key plug, with AWWA C800 threaded inlet and outlet matching service piping material.

2.7 FIRE HYDRANTS

A. Fire hydrants shall meet UL 262, FM 1120/1130, and ANSI/AWWA C502 standards. The main valve opening shall be 5 ¼" with two hose nozzles and one pumper nozzle. Hydrant shall be Super Centurion 250#A-423 as manufactured by Mueller or approved equal.

2.8 ANCHORAGES

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197 (ASTM A 197M), malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig (20.7 MPa).

1. Cement: ASTM C 150, Type I.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

2.9 IDENTIFICATION

A. Use detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

C. Do not use flanges or keyed couplings for underground piping.

1. Exception: Piping in boxes and structures, but not buried, may be joined with flanges or keyed couplings instead of joints indicated.

D. Flanges, keyed couplings, and special fittings may be used on aboveground piping.

3.2 JOINT CONSTRUCTION

A. Copper Tubing, Brazed Joints: According to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

B. Copper Tubing, Soldered Joints: According to CDA's "Copper Tube Handbook."

C. PVC Piping, Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.

D. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

3.3 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

B. Install components with pressure rating equal to or greater than system operating pressure.

C. Install piping free of sags and bends.

D. Install fittings for changes in direction and branch connections.

E. Piping Connections: Unless otherwise indicated, make piping connections as specified below:

1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.

2. Install dielectric fittings to connect piping of dissimilar metals.

3.4 PIPING INSTALLATION

A. Make connections, 2-inch NPS (DN50) and smaller, according to the following:

1. Install service clamps and corporation stops in size, quantity, and arrangement required and according to manufacturer's written instructions.

2. Install curb stop in service piping with head pointing up and with cast-iron service box.

B. Comply with NFPA 24 for fire-protection water-service piping materials and installation.

C. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

D. Install AWWA PVC plastic pipe according to AWWA M23 and ASTM F 645.

E. Bury piping with depth of cover over top at least 48 inches.

F. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

3.5 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.
2. Fire-Service Piping: According to NFPA 24.

B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.6 VALVE INSTALLATION

A. General Application: Use mechanical-joint-end valves for 3-inch NPS (DN80) and larger underground installation. Use threaded- and flanged-end valves for installation in pits. Use non-rising-stem UL/FM gate valves. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS (DN50) and smaller installation.

B. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

C. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's written instructions. Install underground curb stops with head pointed up and with cast-iron curb box.

3.7 IDENTIFICATION INSTALLATION

A. Install continuous detectable underground warning tape during back-filling of trench for underground water-service piping. Locate 18 inches (300 mm) below finished grade, directly over piping.

3.8 PRESSURE TEST

A. Pressure and leakage tests shall be performed in accordance with the latest revision of AWWA C600, Section 7.3, HYDROSTATIC TESTING.

B. Final tests must be performed in the presence of the certifying Engineer and prior to disinfecting. Do not conduct any hydrostatic tests until after all associated concrete work has set for a minimum of 7 days for standard concrete or at least 36 hours for high early strength concrete.

C. The test pressure shall be 150 percent of the maximum working pressure or 150 psi. (potable water) 200 psi. fire water, whichever is greater.

D. The allowable leakage will be determined by the following formula.

$$L = \frac{SD \checkmark P}{148{,}000}$$

Where:

L = testing allowance (makeup water), in gallons per hour
S = length of pipe tested in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)

E. All visible leakage must be repaired.

F. Following disinfecting, conduct operating tests in the presence of the certifying Engineer to verify all valves and hydrants are in proper working condition.

3.9 CLEANING

A. Clean (potable and fire) and disinfect (potable only) water distribution piping as follows:

1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and continuous feed method disinfecting procedure only as described in the latest revision of AWWA C651.
    a. All work under this section shall be performed in the presence of the Design Engineer, and a representative of the public health authority having jurisdiction, as required.
    b. Chlorination shall be scheduled such that sampling and flushing will be performed during normal daylight working hours. The contractor shall provide acceptable backflow prevention on all supply water to prevent any potential backflow contamination or cross connection.
    c. Chlorination shall be by the use of a solution of water and liquid chlorine, calcium hypochlorite or sodium hypochlorite and the solution shall be contained in the pipe or structure as specified.
    d. Prior to chlorination, all dirt and foreign matter shall be removed by a thorough cleaning and flushing of the pipeline or structure.
    e. The chlorine solution shall be introduced to pipelines through corporation stops placed in the horizontal axis of the pipe, to structures by means of tubing extending directly into the structure, or other approved methods.
    f. The application of the chlorine solution shall be by means of a controlled solution feed device. The rate of chlorine solution flow shall be in such proportion to the rate of water entering the pipe or structure that the resulting free chlorine residual shall be between 25 and 50 parts per million (PPM), milligrams per liter (mg/l).
    g. The chlorine treated water shall be retained in the pipe or structure at least 24 hours, unless otherwise directed. During the retention period, all valves and hydrants within the treated sections shall be operated.
    h. The chlorine residual shall be not less than 10 PPM (mg/l) at any point in the pipe or structure at the end of the 24-hour retention period.
    i. When making repairs to, or when specified, structures and portions of pipelines shall be chlorinated by a concentrated chlorine solution containing not less than 200 PPM (mg/l) of free chlorine. The solution shall be applied with a brush or sprayed on the entire inner surface of the empty pipes or structures. The structures disinfected shall remain in contact with the strong chlorine solution for at least 30 minutes.
    j. After the required retention of chlorinated water in the pipe or structures, they shall be thoroughly flushed until the replacement water shall, upon test, both chemically and bacteriological, be proven equal to water quality served by the public from the existing water supply system.

k. The disposal of chlorinated water from any pipe or structure shall be such that it will not cause damage to any vegetation, fish, or animal life.

l. The Contractor shall make all arrangements for the testing of water quality by an approved independent laboratory. Two acceptable bacteriological test, taken at least 24 hours apart, shall be collected from the new watermain. At least 1 set of samples must be collected from every 1,000 LF of the new watermain, plus one set from the end of the line and at least one set from each branch. The results for all test shall be forwarded to the Design Engineer and the public health authority having jurisdiction.

m. All water quality requirements shall be fulfilled prior to the passage of any water through the new system to a public supply or the use of the new system.

B. Prepare reports for purging and disinfecting activities.

END OF SECTION 33 1400

SECTION 33 3000 SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements, Section 31 20 00 Earth Moving, Section 31 23 33 Trenching and Backfilling, and Section 31 50 00 Excavation Support and Protection.

1.2 SUMMARY

A. This Section includes sanitary sewerage outside the building.

1.3 DEFINITIONS

A. PE: Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

B. Pressure rated pipe and fittings, 200 psi pressure rating.

1.5 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete tanks and manholes, including cast iron frames and covers.

2. Pipe and fittings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

B. Do not store plastic structures, pipe, and fittings in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 12 (DN375) and Smaller: ASTM D 3034, SDR-35, for solvent-cemented joints or gasketed joints.

    a. Gaskets: ASTM F 477, elastomeric seals.

2. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 2241, SDR 21, for solvent- cemented or gasketed joints.

    a. Gaskets: ASTM F 477, elastomeric seals.

B. Ductile-Iron Pipe and Fittings:

1. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11 "Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings". Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50 "Thickness Design of Ductile-Iron Pipe" Class 52.

2. Restrained joint fittings and the restraining components shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 and/or C153/A21.53. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11.

3. Restrained joint pipe and fittings shall be U.S. Pipe's Tyton Joint Pipe with Field Lok 350 gaskets or approved equal.

4. Cement mortar lining and seal coating for pipe and fittings shall be in accordance with ANSI/AWWA C104/A21.4 Asphaltic outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 for fittings.

5. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350

psi for sizes 4-inch through 24-inch.

6. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.

2.2 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

1. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
2. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
3. Bands: Stainless steel, at least one at each pipe insert.

B. Pipe and Tube Fittings:

1. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Units have 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections. Include 250-psig (1725-kPa) minimum working-pressure rating; epoxy, interior coating according to AWWA C550; length for offset and expansion indicated; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
2. Ductile-Iron, Deflection Fittings: Compound coupling fitting with sleeve and flexing sections, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include 250-psig (1725-kPa) minimum working-pressure rating; cement- mortar lining or epoxy, interior coating according to AWWA C550; deflection of at least 20 degrees (0.34 radians); and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
3. Ductile-Iron Fittings for PVC Pipe: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type; push-on- or mechanical-joint type. Include dimensions matching PVC pipe, cement-mortar lining and seal coat according to AWWA C104, and rubber compression gaskets according to AWWA C111.
4. Mechanical joint restraining glands shall be “megalug 2000 PV” as manufactured by Ebaa Iron Sales, Inc. or approved equal.

2.3 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches (1200 mm) minimum, unless otherwise indicated. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 5-inch (125-mm) minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
3. Riser Sections: 5-inch (125-mm) minimum thickness, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229- mm) total

thickness, that match 24-inch- (610-mm-) diameter frame and cover.

7. Steps: Fiberglass individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12-inch (300-mm) intervals.
8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.
9. Shall be designed for H-20 loading.

B. Manhole Frames and Covers: ASTM A -48, Class 35B, gray iron castings designed for heavy- duty service. Include 22⅜-inch ID by 6-inch (150-mm) riser with 4-inch (100-mm) minimum width flange, and 24-inch- diameter cover. Include indented top design with lettering "SEWER" cast into cover.

2.4 CONCRETE

A. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water- cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 400), deformed steel.

B. Structure Channels and Benches: Factory or field formed from concrete. Portland cement de- sign mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
    a. Invert Slope: 2 percent through manhole.
2. Benches: Concrete, sloped to drain into channel.
    a. Slope: 4 percent.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with

1. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 5-inch (125-mm) minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
3. Riser Sections: 5-inch (125-mm) minimum thickness, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229- mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.
7. Steps: Fiberglass individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12-inch (300-mm) intervals.
8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe

connecting to base section.

9. Shall be designed for H-20 loading.

D. Manhole Frames and Covers: ASTM A -48, Class 35B, gray iron castings designed for heavy- duty service. Include 22⅝-inch ID by 6-inch (150-mm) riser with 4-inch (100-mm) minimum width flange, and 24-inch- diameter cover. Include indented top design with lettering "SEWER" cast into cover.

2.5 CONCRETE

A. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water- cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 400), deformed steel.

B. Structure Channels and Benches: Factory or field formed from concrete. Portland cement de- sign mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

    a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

    a. Slope: 4 percent.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 400), deformed steel.

2.6 PROTECTIVE COATINGS

A. Description: One-coat, coal-tar epoxy; 15-mil (0.38-mm) minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

1. Concrete Manholes: On exterior surface.

2.7 CLEANOUTS

A. PVC Cleanouts: PVC body with PVC threaded cap. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping. Cleanout to be encased in minimum 6” I.D. Valve box cover with “sewer” stamped on cover.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 Earth Moving and Section 31 23 33 Trenching and Backfilling.

3.2 IDENTIFICATION

A. Materials and their installation are specified in Section 31 20 00 Earth Moving for installing green warning tape directly over piping buried 18" from finished grade.

3.3 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Gravity-Flow Piping: Use the following:

1. NPS 4, NPS 6 and NPS 8 (DN100 and DN200): PVC, SDR 35, sewer pipe and fittings; solvent-cemented joints; or gaskets and gasketed joints.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

    a. Sleeve type to join piping, of same size, or with small difference in OD.
    b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.

2. Use the following pipe couplings for pressure applications:

    a. Sleeve type solvent cement of same size.

B. Special Pipe Fittings: Use where indicated.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections,

unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber gaskets according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook." Use gaskets that match class of pipe and fittings.

C. DIP Piping, Gasketed Joints: Use joining materials according to ANSI/AWWA C111/A21.11. Construct joints with elastomeric seals and lubricant according to AWWA C600 or AWWA M41 and pipe manufacturer’s written instructions.

D. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

E. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Join profile sewer pipe fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.
3. Install according to ASTM D 2321.
4. Join pipe with solvent cement fittings according to ASTMD 2855.

F. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

G. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet. Channels shall be Trowel finished with smooth surface, benches shall have a broom finish.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3” above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

3.8 CLEANOUT INSTALLATION

A. Set cleanout frames and covers flush with surrounding grade or as indicated on plans.

B. Set cleanout frames and covers in pavement areas with tops flush with pavement surface.

3.9 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

C. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN100 to DN500). Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

D. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses.

1. Place plug in end of incomplete piping at end of day and when work stops.
2. Flush piping between manholes and other structures to remove collected debris, if re- quired by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or re- paired, for leaks and defects.

1. Do not put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.
5. Manholes and Sanitary Sewerage: Perform manhole vacuum testing in accordance with the latest revision of ASTM C1244-02. Perform low-pressure air testing of piping in accordance with the latest revision of ASTM F1417-92, Section 8.2.2, Time-Pressure Drop Method for a 0.5 psi drop.
6. Sewer Forcemain: Perform pressure and leakage test hydrostatically. Each forcemain test shall be for a minimum of 2 hours and at a minimum test pressure of 1.5 times operation pressure or 50 psi, whichever is greater. Allowable leakage for each forcemain is 0.5 gallons per 1,000 feet for 30 minutes.

END OF SECTION 333000

SECTION 33 3211 GRINDER PUMP STATIONS

Part 1 - General

1.1 GENERAL DESCRIPTION

A. The MANUFACTURER shall furnish complete factory-built and tested grinder pump unit(s), each consisting of a grinder pump core(s) all suitably mounted on an integral stand of stainless steel, special polyethylene tank, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly/shut-off valve, anti-siphon valve/check valve assembly, electrical alarm assembly and all necessary internal wiring and controls. For ease of serviceability, all pump motor/grinder units shall be of like type and horsepower throughout the system.

1.2 SUBMITTALS

A. After receipt of notice to proceed, the MANUFACTURER shall furnish a minimum of six sets of shop drawings detailing the equipment to be furnished including dimensional data and materials of construction. The ENGINEER shall promptly review this data, and return two copies as accepted, or with requested modifications. Upon receipt of accepted shop drawings, the MANUFACTURER shall proceed immediately with fabrication of the equipment.

1.3 MANUFACTURER

A. Grinder pump stations, complete with all appurtenances, form an integral system, and as such, shall be supplied by one grinder pump station manufacturer. The CONTRACTOR shall be responsible for the satisfactory operation of the entire system. The equipment specified shall be a product of a company experienced in the design and manufacture of grinder pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for its product, submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts. The MANUFACTURER shall provide, upon request, a reference and contact list from ten of its largest contiguous grinder pump installations of the type of grinder pumps described within this specification.

B. The MANUFACTURER of the grinder pump station shall be Environment One Corporation (or Proposed Alternate).

C. Attention is directed to the fact that the drawings and overall system design are based on a particular piece of equipment from a particular manufacturer. These specifications are intended to provide guidelines for standard equipment of a recognized manufacturer who already meets all the requirements of this specification.

1.4 EXPERIENCE CLAUSE:

A. The equipment furnished hereunder shall be the product of a company experienced in the design and manufacture of grinder pumps specifically designed for use in low pressure systems. All manufacturers proposing equipment for this project shall have at least 10 years of experience in the design and manufacture of units of identical size(s) and performance to the specified units. All manufacturers proposing equipment for this project must also have not less than 500 successful installations of low pressure sewer systems utilizing grinder pumps of like type to the grinder pumps specified herein. An installation is defined as a minimum of 25 pumps discharging into a common force main which forms a low pressure sewer system. The CONTRACTOR (supplier) proposing alternate equipment shall also submit, as part of the bid schedule, an installation list with contact person(s), phone number(s) and date(s) of at least 10 installations of the type of pump specified herein that have been in operation for at least 10 years.

B. In lieu of this experience clause, the CONTRACTOR (supplier) of alternate equipment will be required to submit a 5-year performance bond for 100 percent of the stipulated cost of the equipment as bid and as shown in the Bid Schedule. This performance bond will be used to guarantee the replacement of the equipment in the event that it fails within the bond period.

1.5 **OPERATING CONDITIONS**

A. The pumps shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet (0 PSIG), 11 GPM against a rated total dynamic head of 92 feet (40 PSIG), and 7.8 GPM against a rated total dynamic head of 185 feet (80 PSIG). The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

1.6 **WARRANTY**

A. The grinder pump MANUFACTURER shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, the panel for a period of 24 months after notice of OWNER'S acceptance, but no greater than 27 months after receipt of shipment. Any manufacturing defects found during the warranty period will be reported to the MANUFACTURER by the OWNER and will be corrected by the MANUFACTURER at no cost to the OWNER.

1.7 **WARRANTY PERFORMANCE CERTIFICATION**

A. As a bid certification requirement, each bidder shall provide with their bid schedule a Warranty Performance Certification statement executed by the most senior executive officer of the grinder pump MANUFACTURER, which certifies a minimum of a 24-month warranty. They must further detail any exclusions from the warranty or additional cost items required to maintain the equipment in warrantable condition, including all associated labor and shipping fees, and certify that the MANUFACTURER will bear all costs to correct any original equipment deficiency for the effective period of the warranty. All preventive maintenance type requirements shall be included in this form as exclusions. These requirements include, but are not limited to, unjamming of grinder mechanism, periodic motor maintenance, and periodic cleaning of liquid level controls. Should the CONTRACTOR (supplier) elect to submit a performance bond in lieu of the experience clause outlined above, this Warranty Performance Certification shall also be used as a criterion to evaluate the CONTRACTOR'S (supplier's) performance over the warranty period. A Warranty Performance Certification form is included with the bid schedule and must be completed and submitted as part of the bid package. Bids with incomplete forms or missing forms will be considered nonresponsive.

2.0 PRODUCT

2.1 PUMP

A. The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. Double radial O-ring seals are required at all casting joints to minimize corrosion and create a protective barrier. All pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. This material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service.

2.2 GRINDER

A. The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder impeller shall be a one-piece, 4140 cutter wheel of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 – 60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque. These materials have been chosen for their capacity to perform in the intended environment as they are materials with wear and corrosive resistant properties.

B. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

   1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.

   2. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second. This is a critical design element to minimize jamming and as such must be adhered to.

   3. The inlet shroud shall have a diameter of no less than 5 inches. Inlet shrouds that are less than 5 inches in diameter will not be accepted due to their inability to maintain the specified 4 feet per second maximum inlet velocity which by design prevents unnecessary jamming of the cutter mechanism and minimizes blinding of the pump by large objects that block the inlet shroud.

   4. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.

C. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of “foreign objects,” such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

2.3 ELECTRIC MOTOR

A. As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F insulation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. The motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. The motor protector shall be specifically investigated and listed by Underwriters Laboratories Inc. for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. The wet portion of the motor armature must be 300 Series stainless steel. To reduce the potential of environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oil-filled motors will not be accepted. Pump operation during instances of potentially damaging high current or low voltage conditions shall be inhibited by an in-pump electrical monitoring system that has been investigated and listed by Underwriters Laboratories Inc. for the application. Motor start shall be controlled by a DC driven electromechanical relay integrated within the control compartment of the pump. Electrical monitoring shall ensure the relay operates reliably. AC Mechanical contactors for motor start are susceptible to damage from short cycling and will not be accepted.

2.4 MECHANICAL SEAL

A. The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

2.5 PUMP PIT: Polyethylene Construction

A. The tank shall be made of rotational molded polyethylene with high environmental stress cracking resistance. All seams created during tank construction are to be factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

B. The overall basin capacity shall be 486 gallons. The basin shall incorporate a tapered bottom with an inside diameter of no greater than 46 inches, reducing to a diameter of no greater than 42 inches to minimize the retained volume. The largest diameter must be no less than 50 inches and no greater than 52 inches.

C. A station that is 75 inches tall shall have no greater than a 50 inch outside diameter hinged aluminum cover. The 75 inch tall station can be extended in 6 inch increments with normal cylindrical fiberglass extensions.

D. Taller stations shall have a fiberglass accessway with a hinged, aluminum cover. The accessway shall be an extension of the wetwell assembly and shall include a lockable cover assembly, with vent, providing low profile mounting. The cover shall be aluminum, with a load rating of 300 pounds per square foot. The cover shall have an outside diameter of no greater than 50 inches. Accessway design and construction shall enable field extension of station height in 6-inch increments without the use of any adhesives or sealants requiring cure time before installation can be completed. The accessway wall must withstand the pressure exerted by saturated soil loading at maximum burial depth and must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

E. The tank and factory penetrations shall be factory tested and guaranteed to be watertight.

F. The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. Tank dimensions shall be as shown on the contract drawings.

G. The discharge bulkheads (manifolds) shall be factory installed and warranted by the manufacturer to be watertight. The following provides a description and orientation of the discharge bulkhead(s) for each station type:

- QUADPLEX STATION – The tank shall have two stainless steel duplex discharge manifolds, each terminating outside the tank wall with a 1-1/4” female NPT pipe thread and located 180 degrees from each other.

2.6 DISCHARGE HOSE AND DISCONNECT/VALVE

A. All discharge fittings and piping shall be constructed of polypropylene, EPDM or PVC. The discharge hose assembly shall include a shut-off valve rated for 200 psi WOG and a quick disconnect feature to simplify installation and pump removal. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

2.7 ELECTRICAL QUICK DISCONNECT

A. The grinder pump core shall include a factory-installed NEMA 6P electrical quick disconnect (EQD) for all power and control functions. The EQD will be supplied with 32’ total, 25’ of useable, electrical supply cable (ESC) to connect to the alarm panel. The EQD shall require no tools for assembly, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque.

Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. Junction boxes are not acceptable due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required.

2.8 CHECK VALVE

A. The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection molded part made of an engineered thermoplastic resin. The valve shall be rated for continuous operating pressure of 235 psi. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.

2.9 ANTI-SIPHON VALVE

A. The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the discharge piping. Moving parts will be made of 300 Series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.

2.10 CORE UNIT

A. The grinder pump station shall have an easily removable core assembly containing pump, motor, grinder, all motor controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. The watertight integrity of the core unit shall be established by a 100% factory test at a minimum of 5 PSIG.

2.11 CONTROLS

A. All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless steel fasteners. Locating motor starting controls in a plastic enclosure is not acceptable. Wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls. Level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. Level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. Level sensing housing must be a high-impact thermoplastic copolymer over-molded with a thermo plastic elastomer. The use of PVC for the level sensing housing is not acceptable.

B. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The air column shall be integrally molded from a thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily-exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.

C. All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a FACTORY INSTALLED NEMA 6P EQD half attached to it.

2.12 STAINLESS STEEL CURB STOP/CHECK VALVE ASSEMBLY (UNI-LATERAL)

A. The curb stop shall be pressure-tight in both directions. The ball valve actuator shall include position stop features at the fully opened and closed positions. The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi.

B. The stainless steel check valve shall be integral with the curb stop valve. The check valve will provide a full-ported 1-1/4" passageway and shall introduce minimal friction loss at maximum rated flow. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressure.

C. Engineered Thermoplastic Fittings – All plastic fitting components are to be in compliance with applicable ASTM standards.

D. All pipe connections shall be made using compression fitting connections including a Buna-N O-ring for sealing to the outside diameter of the pipe. A split-collet locking device shall be integrated into all pipe connection fittings to securely restrain the pipe from hydraulic pressure and external loading caused by shifting and settling.

E. Curb Boxes – Curb boxes shall be constructed of ABS, conforming to ASTM-D 1788. Lid top casting shall be cast iron, conforming to ASTM A-48 Class 25, providing magnetic detectability, and be painted black. All components shall be inherently corrosion-resistant to ensure durability in the ground. Curb boxes shall provide height adjustment downward (shorter) from their nominal height.

F. High Density Polyethylene Pipe (Supplied by others) – Pipe shall be have a working pressure of 160 psi minimum and shall be classified SDR per ASTM D 3035.

G. Pipe Dimensions – The SDR (Standard Dimension Ratio) of the pipe supplied shall be as specified by the SPECIFYING ENGINEER. SDR 7, 9 and 11 fittings are available from the MANUFACTURER.

H. Factory Test – The stainless steel, combination curb stop/check valve component shall be 100 percent hydrostatically tested to 150 psi in the factory.

I. Construction Practices – Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking should be in accordance with the pipe manufacturer's recommendations. The pipe should be handled in such a manner that it is not damaged by being dragged over sharp objects or cut by chokers or lifting equipment.

J. Segments of pipe having cuts or gouges in excess of 10 percent of the wall thickness of the pipe shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the butt fusion joining method.

Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. The joining method shall be the butt-fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt-fusion equipment used in the joining procedure shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment, and fusion pressure.

K. Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable-type chokers should be avoided. Nylon slings are preferred. Spreader bars should be used when lifting long, fused sections. Care should be exercised to avoid cutting or gouging the pipe.

L. Installation – Assemble the compression fittings according to the fitting manufacturer's recommendations.

M. The trench and trench bottom should be constructed in accordance with ASTM D 2321. Embedment materials should be Class I, Class II or Class III materials as defined in ASTM D 2321. The use of Class IV and/or Class V materials for embedment is not recommended and should be allowed only with the approval of the SPECIFYING ENGINEER. Bedding of the pipe should be performed in accordance with ASTM D 2321. Compaction should be as specified in ASTM D 2321. Deviations from the specified compaction shall be approved by the SPECIFYING ENGINEER.

N. Haunching and initial backfill should be as specified in ASTM D 2321 using Class I, Class II or Class III materials. Materials used and compaction shall be as specified by the SPECIFYING ENGINEER. In cases where a compaction of 85 percent Standard Proctor Density is not attainable, the SPECIFYING ENGINEER may wish to increase the SDR of the pipe to provide adequate stiffness. ASTM D 2321 sections titled "Minimum Cover for Load Application," "Use of Compaction Equipment" and "Removal of Trench Protection" should apply unless directed otherwise by the SPECIFYING ENGINEER.

2.13 DUPLEX PROTECT PLUS:

A. Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The standard enclosure shall not exceed 12.5" W x 16" H x 7.5" D.
B. The panel shall contain one 15-amp single pole circuit breaker for the alarm circuit and one 15-amp double pole circuit breaker per core for the power circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.
C. The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).
D. The high-level alarm system shall operate as follows:
    1. The panel will go into alarm mode if either pump's alarm switch closes. During the initial alarm mode both pumps will run and the alarm light and buzzer will be delayed for a period of time based on user settings (default is 3-1/2 minutes). If the station is still in high-level alarm after the delay, the light and buzzer will be activated.
    2. The audible alarm may be silenced by means of the externally mounted push-to-silence button.
    3. The visual alarm remains illuminated until the sewage level in the wet well drops below the "off" setting of the alarm switch for both pumps.
E. The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc.
F. Contains the following features:

- Alarm Activated Dry Contacts – Normally open relay contact closes upon alarm activation.

- Alarm Activated Contacts for Remote Indoor Alarm Module – Will work with or without power to the alarm panel and is designed to work with E/One's Remote Sentry.

- Includes Inner Door Dead Front

- Separate LED's for each condition

G. Provides protection from the following operating conditions:

- Low Voltage (Brownout) Protection – A lockout cycle will prevent the motor from operating and will illuminate the Trouble LED if:
  - the incoming AC Mains voltage drops below a predetermined minimum, typically 12% of nameplate (211 volts for a 240 volt system) for 2 to 3 seconds, regardless of whether the motor is running
  - the lockout cycle will end if the incoming AC Mains voltage returns to a predetermined value, typically 10% of nameplate (216 volts for a 240 volt system).

  The system continues to retest the voltage every second indefinitely. If the lockout cycle has been initiated and the voltage comes back above the predetermined starting voltage, the system will function normally. The Trouble LED remains illuminated during a Brownout condition and a corresponding Brownout message will be displayed on the LCD screen. The LED will turn off when the Brownout condition ends and the LCD message remains latched until the panel is reset. The audible and visual alarm will not be activated unless there is a high wastewater level in the tank.

- Run Dry Protection – A 20-minute lockout cycle will prevent the motor from operating and will illuminate the Trouble LED when the wastewater level in the tank is below the pump inlet shroud. A corresponding Run Dry message will be displayed on the LCD screen. The condition is rechecked every 20 minutes and the LCD message remains latched. If the condition is satisfied, the pump is allowed to cycle normally and the Trouble LED will go out, but the LCD message remains latched. The LCD message will remain latched until the panel is reset. If the condition is not satisfied after 3 consecutive attempts, the visual alarm will be activated until the panel is reset or until there is one cycle of normal operation. If a high level condition is presented at any time, a pump run cycle will be activated.

- High System Pressure Protection – A 20-minute lockout cycle will prevent the motor from operating and will illuminate the Trouble LED when the pressure in the discharge line is atypically high (closed valve or abnormal line plug). A corresponding Overpressure message will be displayed on the LCD screen. The condition is rechecked every 20 minutes. If the condition is satisfied, the pump is allowed to cycle normally and the Trouble LED will turn off, but the LCD message remains latched. The LCD message will remain latched until the panel is reset. If the condition is not satisfied after 3 consecutive attempts, the pump is locked out indefinitely and the audible and visual alarm will be activated. The LCD message and alarms will remain latched until the condition is removed and the panel is reset.

H In all of the above cases, if more than one error condition is presented, the LCD message depicting the most recent error condition will be displayed.

PROTECT PLUS FEATURES:

- High/Low Voltage monitoring with Trouble indication
- High/Low Wattage (wattage is used instead of current because it is a better indicator of pump performance) monitoring with Trouble indication
- Extended Run Time monitoring with Trouble indication

- Cycle/Event Counter
- Run Time Counter (Hour Meter)
- Run Time Limit — time adjustable, user-selected options: 10 minutes (default) to 120 minutes in 1-minute intervals
- Power-up Delay — time adjustable, user-selected options: None (default), to 300 minutes in 1-minute intervals
- Alarm Delay — time adjustable, user-selected options: zero to 10 minutes in 30-second increments; 4 minutes is default
- System self-test diagnostic
- User-selectable Alarm latch
- User-selectable Protect Mode disable
- User-selectable buzzer timer

Specific Duplex Protect PLUS indicators and programming features shall include:

- Ready LED to indicate AC power to the station is satisfactory
- Pump Run LED to indicate pump is operating (LCD indicates which pump is running)
- Trouble LED indicator and predictive Visual Alarm notification ("blinking" alarm lamp; clears on Normal cycle)
- High Level Alarm LED indicator (LCD indicates which pump is in alarm)
- Manual Run switch to manually activate pumps
- Lead/Lag indication (LCD indicates which pump is lead)
- Menu-driven programmable controller with navigation overlay-type buttons (Enter, Scroll, Up, Down)
- Normal Operation LED and Mode button for Mode status
- Pump Performance menu LED with LCD display of the following pump performance statistics:
    - Real-time Voltage
    - Real-time Amperage
    - Real-time Wattage
    - Minimum/Maximum/Average Voltage
    - Minimum/Maximum/Average Amperage
    - Minimum/Maximum/Average Wattage
    - Minimum/Maximum Run-time
    - Average Run-time
    - Last Run-time
    - Cycle/Event Counter
    - Run Time Counter (Hour Meter)
- Diagnostics Menu LED
- Initialize System Menu LED
- Run Limit Menu LED
- Alarm Delay Menu LED
- Power Delay Menu LED
- Pump alternating options (no alternation, adjustable time based and test)
- Pump alternating time options — 24 hours to 72 hours in 12-hour increments

Service Equipment/Main Service Disconnect Breaker – A separate, internal breaker that is rated and approved for use as "service equipment" and acts as a main service disconnect of the grinder pump station shall be provided.

Remote Sentry Indoor Alarm Module – A separate, remote indoor alarm module shall be provided to indicate a high level alarm with or without AC power to the grinder pump station. The Remote Sentry indoor alarm module shall have an internal power source enabling its continued operation without AC power. The Remote Sentry shall have an audible alarm and a visual alarm, both of which shall automatically reset if the high level alarm condition

is eliminated. The Remote Sentry indoor alarm module shall include a Silence button for the audible alarm and a Test button.

External Autodialer –

- Four separate voice message alarm zones
- Calls up to 8 telephones, cell phones or pagers
- Built-in line seizure
- Remote Turn Off feature allows termination of activated channel
- EEPROM Memory retains program despite power loss
- Listen-in verification and communication
- Universal dial tone
- Built-in auxiliary output to drive external siren, strobe or relay
- Five optional settings for notifications of a power loss occurrence — instantaneous, 15 minutes, 2 hours, 12 hours or 24 hours
- One channel for power-loss sensing, three hardwired channels for additional input
- Dialer senses loss of power and based on setting; will notify parties of loss condition only when specified time has elapsed
- If power restores before set time has elapsed, no call will be made
- Package includes battery backup and transformer

QUADPLEX STATION: Shall incorporate two duplex panels as described above.

2.14 SERVICEABILITY

A. The grinder pump core, including level sensor assembly, shall have two lifting hooks complete with lift-out harness connected to its top housing to facilitate easy core removal when necessary. The level sensor assembly must be easily removed from the pump assembly for service or replacement. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. Each EQD half must include a water-tight cover to protect the internal electrical pins while the EQD is unplugged. A pump push-to-run feature will be provided for field trouble shooting. The push-to-run feature must operate the pump even if the level sensor assembly has been removed from the pump assembly. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

2.15 OSHA CONFINED SPACE

A. All maintenance tasks for the grinder pump station must be possible without entry into the grinder pump station (as per OSHA 1910.146 Permit-required confined spaces). *"Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space."*

2.16 SAFETY

A. The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired grinder pump station shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use. UL listing of components of the station, or third-party testing to UL standard are not acceptable.
B. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of

compliance with this requirement, the grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard is not acceptable.

3.0 EXECUTION

3.1 FACTORY TEST

A. Each grinder pump shall be submerged and operated for 1.5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge assembly and each unit's dedicated level controls and motor controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps is not acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two different points on its curve. Additional validation tests include: integral level control performance, continuity to ground and acoustic tests of the rotating components.

B. The ENGINEER reserves the right to inspect such testing procedures with representatives of the OWNER, at the GRINDER PUMP MANUFACTURER'S facility.

C. All completed stations shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).

3.2 CERTIFIED SERVICE PROGRAM

A. The grinder pump MANUFACTURER shall provide a program implemented by the MANUFACTURER'S personnel as described in this specification to certify the service company as an authorized serviced center. As evidence of this, the MANUFACTURER shall provide, when requested, sufficient evidence that they have maintained their own service department for a minimum of 30 years and currently employ a minimum of five employees specifically in the service department.

B. As part of this program, the MANUFACTURER shall evaluate the service technicians as well as the service organization annually. The service company will be authorized by the MANUFACTURER to make independent warranty judgments. The areas covered by the program shall include, as a minimum:

1. Pump Population Information — The service company will maintain a detailed database for the grinder pumps in the territory that tracks serial numbers by address.

2. Inventory Management — The service company must maintain an appropriate level of inventory (pumps, tanks, panels, service parts, etc.) including regular inventory review and proper inventory labeling. Service technicians will also maintain appropriate parts inventory and spare core(s) on service vehicles.

3. Service Personnel Certification — Service technicians will maintain their level-specific certification annually. The certifications are given in field troubleshooting, repair, and training.

4. Service Documentation and Records — Start up sheets, service call records, and customer feedback will be recorded by the service company.

5. Shop Organization — The service company will keep its service shop organized and pumps will be tagged with site information at all times. The shop will have all required equipment, a test tank, and cleaning tools necessary to service pumps properly.

3.3 DELIVERY

A. All grinder pump core units, including level controls, will be delivered to the job site 100 percent completely assembled, including testing, ready for installation. Grinder pump cores will be shipped separately from the tanks. Installing the cores and discharge piping/hose into the tanks is the only assembly step required and allowed due to the workmanship issues associated with other on-site assembly. Grinder pump cores must be boxed for ease of handling.

3.4 INSTALLATION

A. Earth excavation and backfill are specified under SITE WORK, but are also to be done as a part of the work under this section, including any necessary sheeting and bracing.

B. The CONTRACTOR shall be responsible for handling ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding.

C. The grinder pump stations shall not be set into the excavation until the installation procedures and excavation have been approved by the ENGINEER.

D. Remove packing material. User instructions MUST be given to the OWNER. Hardware supplied with the unit, if required, will be used at installation. The basin will be supplied with a standard 4" inlet grommet (4.50" OD) for connecting the incoming sewer line. Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason.

E. Installation shall be accomplished so that 1 inch to 4 inches of accessway, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the excavated hole must be large enough to allow for the concrete anchor.

F. A 6" inch (minimum) layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8" or more than 3/4" shall be used as bedding material under each unit.

G. A concrete anti-flotation collar, as detailed on the drawings, and sized according to the manufacturer's instructions, shall be required and shall be pre-cast to the grinder pump or poured in place. Each grinder pump station with its pre-cast anti-flotation collar shall have a minimum of three lifting eyes for loading and unloading purposes.

H. If the concrete is poured in place, the unit shall be leveled, and filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8" sleeve is required over the inlet prior to the concrete being poured.

I. The CONTRACTOR will provide and install a 4-foot piece of 4-inch SCH 40 PVC pipe with water tight cap, to stub-out the inlet for the property owners' installation contractor, as depicted on the contract drawings.

J. E/One requires that an E/One Uni-Lateral assembly (E/One part number NB0184PXX or NC0193GXX) or E/One Redundant Check Valve (E/One part number PC0051GXX) be installed in the pipe lateral outside the home between the pump discharge and the street main on all installations.

K. The electrical enclosure shall be furnished, installed and wired to the grinder pump station by the CONTRACTOR. An alarm device is required on every installation, there shall be NO EXCEPTIONS. It will be the responsibility of the CONTRACTOR and the ENGINEER to coordinate with the individual property owner(s) to determine the optimum location for the alarm panel.

L. The CONTRACTOR shall mount the alarm device in a conspicuous location, as per national and local codes. The alarm panel will be connected to the grinder pump station by a length of 6-conductor type TC cable as shown on the contract drawings. The power and alarm circuits must be on separate power circuits. The grinder pump stations will be provided with 32 feet total, 25 feet of useable, electrical supply cable to connect the station to the alarm panel. This cable shall be supplied with a FACTORY INSTALLED EQD half to connect to the mating EQD half on the core.

3.5 BACKFILL REQUIREMENTS

A. Proper backfill is essential to the long-term reliability of any underground structure. Several methods of backfill are available to produce favorable results with different native soil conditions. The most highly recommended method of backfilling is to surround the unit to grade using Class I or Class II backfill material as defined in ASTM 2321. Class 1A and Class 1B are recommended where frost heave is a concern; Class 1B is a better choice when the native soil is sand or if a high, fluctuating water table is expected. Class 1, angular crushed stone, offers an added benefit in that it doesn't need to be compacted.

B. Class II, naturally rounded stone, may require more compactive effort, or tamping, to achieve the proper density. If the native soil condition consists of clean compactable soil, with less than 12% fines, free of ice, rocks, roots and organic material, it may be an acceptable backfill. Soil must be compacted in lifts not to exceed one foot to reach a final Proctor Density of between 85% and 90%. Heavy, non-compactable clays and silts are not suitable backfill for this or any underground structure such as inlet or discharge lines.

C. If you are unsure of the consistency of the native soil, it is recommended that a geotechnical evaluation of the material is obtained before specifying backfill.

D. Another option is the use of a flowable fill (i.e., low slump concrete). This is particularly attractive when installing grinder pump stations in augured holes where tight clearances make it difficult to assure proper backfilling and compaction with dry materials. Flowable fills should not be dropped more than four feet from the discharge to the bottom of the hole to avoid separation of the constituent materials.

E. Backfill of clean, native earth, free of rocks, roots, and foreign objects, shall be thoroughly compacted in lifts not exceeding 12" to a final Proctor Density of not less than 85%. Improper backfilling may result in damaged accessways. The grinder pump station shall be installed at a minimum depth from grade to the top of the 1 1/4" discharge line, to assure maximum frost protection. The finish grade line shall be 1" to 4" below the bottom of the lid, and final grade shall slope away from the grinder pump station.

F. All restoration will be the responsibility of the CONTRACTOR. Per unit costs for this item shall be included in the CONTRACTOR'S bid price for the individual grinder pump station. The properties shall be restored to their original condition in all respects, including, but not limited to, curb and sidewalk replacement, landscaping, loaming and seeding, and restoration of the traveled ways, as directed by the ENGINEER.

3.5 START-UP AND FIELD TESTING

A. The MANUFACTURER shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the OWNER'S personnel in the operation and maintenance of the equipment before the stations are accepted by the OWNER.

B. All equipment and materials necessary to perform testing shall be the responsibility of the INSTALLING CONTRACTOR**.** This includes, as a minimum, a portable generator and power cable (if temporary power is required), water in each basin (filled to a depth sufficient to verify the high level alarm is operating), and opening

of all valves in the system. These steps shall be completed prior to the qualified factory trained technician(s) arrival on site.

C. The services of a trained, factory-authorized technician shall be provided for 4 hours on two separate days (8 total).

D. Upon completion of the installation, the authorized factory technician(s) will perform the following test on each station:

1. Make certain the discharge shut-off valve in the station is fully open.

2. Turn ON the alarm power circuit and verify the alarm is functioning properly.

3. Turn ON the pump power circuit. Initiate the pump operation to verify automatic “on/off” controls are operative. The pump should immediately turn ON.

4. Consult the Manufacturer’s Service Manual for detailed start-up procedures.

E. Upon completion of the start-up and testing, the MANUFACTURER shall submit to the ENGINEER the start-up authorization form describing the results of the tests performed for each grinder pump station. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.

4.0 OPERATION AND MAINTENANCE

A. The MANUFACTURER shall supply four copies of Operation and Maintenance Manuals to the OWNER, and one copy of the same to the ENGINEER.

END OF SECTION 333211

SECTION 33 4100
FOUNDATION SUBDRAINAGE SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Building Perimeter drainage systems.

B. Filter aggregate and fabric and bedding.

1.3 RELATED REQUIREMENTS

A. Section 07 1300 - Sheet Waterproofing for drainage board.

B. Section 07 2100 - Thermal Insulation for rigid insulation.

C. Section 31 2301 - Excavation, Backfill and Compaction: Excavating for subdrainage system piping and surrounding filter aggregate.

D. Section 33 4104- Corrugated Polyethylene Storm Drain Pipe

1.4 REFERENCE STANDARDS

A. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe drainage products, pipe accessories, filter fabric drainage board and insulation.

C. Shop Drawings: Indicate dimensions, layout of piping, high and low points of pipe inverts, gradient of slope between corners and intersections.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer, with a minimum of 5 years experience, who has completed foundation drainage systems similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.7 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

B. Subdrainage: Drainage system that collects and removes subsurface or seepage water.

1.8 COORDINATION

A. Coordinate foundation drainage system installation with excavating, trenching, and backfilling.

B. Coordinate drainage panel installation with waterproofing of walls below grade.

C. Coordinate piping termination with storm drainage system.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. Perforated, Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM D 2729, minimum 4" unless shown otherwise.

B. perforated top

2.2 CLEANOUTS

A. Description: ASME A112.36.2M, with round-flanged, cast-iron housing, and secured, excoriated, Medium-Duty Loading class, cast-iron cover. Include cast-iron ferrule and countersunk, brass cleanout plug.

2.3 AGGREGATE AND BEDDING

A. Impervious Fill: Clayey gravel and sand mixture capable of compacting to dense state.

B. Drainage Fill: ¾" washed crushed gravel.

2.4 ACCESSORIES

A. Pipe Couplings: Solid plastic.

B. Geotextile fabrics are specified in Section 31 2316 - Excavation - Building.

C. Drainage panels are specified in 07 1300 - Sheet Waterproofing.

D. Rigid insulation is specified in 07 2100 - Thermal Insulation.

E. Wall Seals: "Flexural" 40-IRHD polymer size as required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavated base is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with compacted fill.

B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.3 INSTALLATION

A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.

B. Place drainage pipe on compacted impervious fill.

C. Apply and compact impervious fill material to raise low areas or where unsatisfactory bearing soil may occur.

D. Use increases, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

1. Extend piping and connect to storm drainage system, of sizes and in locations indicated.

E. Install piping pitched down in direction of flow, at a minimum slope of 1 percent and with a minimum cover of 36 inches, except where otherwise indicated. Do not place piping above finish floor slab.

F. Place pipe with perforations facing down. Mechanically join pipe ends.

G. Install pipe couplings.

H. Instal geo-tech filter in accordance to Section 31 2301 - Excavation, Backfill and Compaction.

I. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.

J. Place aggregate in maximum 4 inch (100 mm) lifts, consolidating each lift.

K. Refer to Section 31 2316 - Excavation - Building for compaction requirements. Do not displace or damage pipe when compacting.

L. Place impervious fill over drainage pipe aggregate cover and compact.

M. Connect to storm sewer system with unperforated pipe, through installed sleeves.

3.4 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Requirements: Field inspection and testing.

B. Testing: Test drain piping with water or visually check piping to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

1. Place additional filtering material to depth of 8 inches around sides and top of drains after testing.

3.5 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION

33 4200 STORM UTILITY DRAIN PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements, Section 31 20 00 Earth Moving, Section 31 23 33 Trenching and Backfilling, and Section 31 50 00 Excavation Support and Protection.

1.2 SUMMARY

A. This Section includes storm drainage as shown on the project drawings.

1.3 DEFINITIONS

A. HDPE: High-Density Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete inlets, catch basins, and other structures, including frames, covers, and grates.

2. Drainage Piping.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 Requirements.

B. Do not store plastic structures, pipe, and fittings in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle precast concrete inlets and other structures according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.2 PIPES AND FITTINGS

A. Corrugated PE Drainage Tubing and Fittings: AASHTO M 252, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252, corrugated, matching tube and fittings to form soiltight joints.

B. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 294, corrugated, matching pipe and fittings to form soiltight joints.

C. PVC Type PSM Solid and Perforated Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends
3. Gaskets: ASTM F 477, elastomeric seals
4. Perforations: ASTM F758 / AASHTO M278 Hole Pattern

2.3 STORMWATER INLETS

A. Yard Drain Inlets: Made with horizontal gutter opening, of materials and dimensions according to the project drawings. Include heavy-duty frames and grates.

B. Catch Basins: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to project drawings. Include heavy-duty frames and grates.

C. Drain Inlets: Made with horizontal gutter opening, of materials and dimensions according to the project drawings. Include heavy-duty frames and grates.

D. Frames and Grates: Dimensions, opening pattern, free area, and other attributes as indicated on the project drawings.

1. Material: ASTM A 536, Grade 60-40-18 minimum, ductile-iron casting.

2.4 CONCRETE

A. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, (Grade 420) deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 Earth Moving and Section 31 23 33 Trenching and Backfilling.

3.2 PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 4 and NPS 6 (DN100 and DN150): Corrugated PE drainage tubing and fittings, silttight couplings, and coupled joints.
2. NPS 8 to NPS 15 (DN200 to DN375): Corrugated PE drainage tubing and fittings, soiltight couplings, and coupled joints in NPS 8 and NPS 10 (DN200 and DN250). Use corrugated PE pipe and fittings, soiltight couplings, and coupled joints in NPS 12 and NPS 15 (DN300 and DN375).

3.3 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.

3.4 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

F. PE Pipe and Fittings: As follows:
   1. Join Pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer's written instructions.
   2. Install according to ASTM D 2321 and manufacturer's written instructions.
   3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings".

G. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

H. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.5 STORMWATER INLET INSTALLATION

A. Construct inlets to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.6 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses.

   1. Place plug in end of incomplete piping at end of day and when work stops.
   2. Flush piping between inlets and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:

      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.

   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.

END OF SECTION 33 4100

APPENDIX

- GEOTECHNICAL INVESTIGATION
- ASBESTOS REPORT
- SECURITY EQUIPMENT CUTS

ENVIROSCIENCE CONSULTANTS
A Mainline Company
2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

August 20, 2023

Mr. Glen Freyer
Facilities Director
Brewster CSD
30 Farm to Market Road
Brewster, NY 10509

RE: Utility Markouts and Geotechnical Borings
CV Starr Intermediate School
20 Farm to Market Road, Brewster, NY

Dear Mr. Freyer,

At your request, we performed Ground Penetrating Radar utility markouts and subsurface locating work at CV Starr Intermedate School on July 13, 2023. We then proceeded with the five geotechnical soil borings on July 17th through July 19th. The borings were placed in locations by the geotechnical engineer based on the floor plan of the new construction and site conditions.

Attached please find our subsurface markouts, boring logs, corresponding sketches and Geotechnical Engineering report by Carlin Simpson & Associates, LLC.

Sincerely,

Kathryn Loddengaard
Department Manager of Environmental Services

CARLIN • SIMPSON & ASSOCIATES, LLC

Consulting Geotechnical and Environmental Engineers

61 Main Street, Sayreville, New Jersey 08872
Tel. (732) 432-5757
Fax. (732) 432-5717

Principal:
Robert B. Simpson, P.E.

Associates:
Meredith R. Anke, P.E.
Stephen Rossi, P.E.
Catherine Simpson, P.E.
Michal Wroblewski, P.E.
Kurt W. Anke
Eric J. Shaw

28 August 2023

Enviroscience Consultants
2150 Smithtown Avenue
Ronkonkoma, NY 11779

Attn: Ms. Kathryn Loddengaard
Dept Manager of Environmental Services

Re: Report on Subsurface Soil and Foundation Investigation
Proposed Addition
C.V. Starr Intermediate School
Brewster, NY (CSA Job #23-83)

Dear Ms. Loddengaard:

In accordance with our proposal dated 7 June 2023 and your subsequent authorization, we have completed a Subsurface Soil and Foundation Investigation for the referenced site. The purpose of this study was to determine the nature and engineering properties of the subsurface soil and the groundwater conditions for the new construction, to recommend a practical foundation scheme, and to determine the allowable bearing capacity of the site soils.

We understand that the proposed construction will consist of a new addition to the existing school building. To guide us in this study, you have provided us with a plan that indicates the location of the proposed construction.

Our scope of work for this project included the following:

1. Reviewed the proposed layout, the existing site conditions, the expected soil conditions, and planned this study.

2. Provided oversight as Soil Testing Inc. advanced five (5) borings at selected locations on the subject site.

3. Laid out the boring locations in the field, visually identified the soil layers encountered, obtained soil samples, and prepared detailed boring logs and a Boring Location Plan.

4. Performed soil identification tests on selected soil samples in our laboratory.

5. Analyzed the field and laboratory test data and prepared this report containing the results of this study.

1.0 SITE DESCRIPTION

The project site is located at 20 Farm to Market Road in Brewster, New York. The site is currently occupied by the existing C.V. Starr Intermediate School Building. The area of the project site consists of grass landscape and asphalt paved walkways. Site grades generally slope down from south to north and range from approximately elevation +532.0 to elevation +520.0.

2.0 PROPOSED CONSTRUCTION

We understand that the proposed construction will consist of a new addition to the C.V. Starr Intermediate School building. The addition is planned to be a cafetorium located on the eastern side of the existing building. Site improvements will also include asphalt paved walkways, concrete staircases and ramps, and new underground utilities.

The following evaluation is based on the limited information that has been provided to our office as of the date of this report. Once the construction plans have been further developed, a copy of the plans should be forwarded to our office so that we can review them along with the recommendations in this report. At that time, any changes or additional recommendations can be provided, if required.

3.0 SUBSURFACE CONDITIONS

To determine the subsurface soil and groundwater conditions at the site, five (5) borings were advanced by Soil Testing Inc. at the locations shown on the enclosed Boring Location Plan. The borings were performed using hollow stem augers and split spoon sampling. The borings were completed in July 2023 under the full-time inspection of Carlin-Simpson & Associates. Detailed boring logs have been prepared and are included in this report. Our field engineer visually identified all of the soil samples obtained during the boring operations and selected samples were tested in our laboratory.

3.1 Soils

The soil descriptions shown on the boring logs are based on the Burmister Classification System. In this system, the soil is divided into three components: Sand (S), Silt ($) and Gravel (G). The major component is indicated in all capital letters, the lesser in lower case letters. The following modifiers indicate the quantity of each lesser component:

Modifier	Quantity
trace (t)	0 -10%
little (l)	10% - 20%
some (s)	20% - 35%
and (a)	35% - 50%

The subsurface soil conditions encountered in the test borings can be summarized as follows:

Stratum 1 At the surface of each of the borings is topsoil that ranges from approximately
Topsoil 4 to 12 inches in thickness.

Stratum 2 Existing Fill — Below the topsoil in borings B-2, B-4, and B-5 is existing fill that generally consists of loose to medium dense brown coarse to fine SAND, little (to some) Silt, little (to some) coarse to fine Gravel. The existing fill extends to depths ranging from 2'0" to 9'0" below the existing ground surface elevation at the boring locations.

Stratum 3 Silty Sand — Underlying the topsoil in borings B-1 and B-3 and below the existing fill in borings B-2 and B-4 is loose to medium dense gray, brown, coarse to fine SAND, little (to and) Silt, trace (to little) medium to fine Gravel. The silty sand stratum extends to depths ranging from 2'0" to 4'6" below the existing ground surface at the boring locations.

Stratum 4 Clayey Silt — Beneath the silty sand in borings B-1, B-2, B-3, and B-4 and below the existing fill in boring B-5 is medium stiff to very stiff dense gray, brown gray Clayey SILT trace (to some), coarse to fine Sand, trace (to little) medium to fine Gravel. An interbedded layer of gray coarse to fine Sand, and Silt was observed in boring B-3 from 11'0" to 14'0" below the existing ground surface. Each of the borings was terminated in the clayey silt stratum at depths ranging from 32'0" to 42'0" below the existing ground surface.

3.2 Groundwater

Observations for groundwater were made during sampling and upon completion of the drilling operations at select boring locations. During this investigation, the groundwater readings at borings B-1 through B-4 ranged from 4'9" to 11'0" below the existing ground surface (elevations +515.3 to +516.0). Evidence of seasonal high groundwater (i.e. mottling) was observed in borings B-3 and B-4 at depths of 2'0" and 2'6" below the existing ground surface (elevations +518.0 and +522.5), respectively. The groundwater observations are summarized in Table 1 below.

Based on the groundwater conditions at the site and the anticipated construction, we do not expect groundwater to be encountered during construction. In the event that water is encountered in the site excavations, proper groundwater control measures (i.e. dewatering with sumps and pumps) will be required.

Variations in the location of the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, and other factors not immediately apparent at the time of this exploration.

3.3 Summary of Boring Observations

A summary of the boring observations is provided in Table 1 below.

Table 1 – Summary of Boring Observations

Boring No.	Approximate Ground Surface Elevation	Depth to Groundwater (Elevation)	Depth to Bottom of Existing Fill (Elevation)
B-1	+527.0	11'0" (+516.0)	NE
B-2	+525.0	9'0" (+516.0)	2'0" (+523.0)

Boring No.	Approximate Ground Surface Elevation	Depth to Groundwater (Elevation)	Depth to Bottom of Existing Fill (Elevation)
B-3	+520.0	4'9" (+515.3) *2'0" (+518.0)	NE
B-4	+525.0	10'0" (+515.0) * 2'6" (522.5)	2'6" (+522.5)
B-5	+532.0	NWR	9'0" (+523.0)

NE – Not Encountered
(*) – Evidence of Seasonal High Groundwater (i.e. mottling)

4.0 SUMMARY OF DESIGN RECOMMENDATIONS

Below is a summary of the major design and construction considerations for the proposed construction. Additional recommendations are provided in the following sections of this report.

- *Subsurface Conditions for the Proposed Construction (Section 3.0)*
  - Existing fill was encountered in borings B-2, B-4, and B-5 to depths ranging from 2'0" to 9'0" below the existing ground surface (elevation +522.5 to +523.0).
  - Groundwater was encountered in borings B-1 through B-4 and ranged from 4'9" to 11'0" below the existing ground surface (elevations +515.3 to +516.0).
  - A summary of the subsurface observations is provided in Table 1 above.

- *New Addition Area Preparation (Section 5.1)*
  - Surface materials (i.e. topsoil and asphalt) must be stripped from the proposed construction area.
  - The existing fill is not suitable for support of the proposed building addition foundations. Where existing fill is encountered in the building area it must be completely removed and replaced with new compacted fill.
  - The exposed subgrade shall be densified with several passes of a vibratory roller prior to placing compacted fill or once the planned building subgrade has been achieved in cut areas.
  - New backfill shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557).

- *New Addition Foundation Recommendations (Section 5.2)*
  - Test pits should be performed adjacent to the existing building to evaluate the existing building foundation, bearing material, and presence of existing fill.
  - Where adjacent to the existing building, the building addition foundations must bear at the same elevation as the existing building.
  - The new addition foundations may be designed as spread footing type foundations bearing on virgin soil or engineer-approved compacted fill.
  - The net design bearing pressure is 4,000 psf.
  - The minimum depth for frost protection is 48 inches.
  - Seismic Site Class is D or Stiff Soil Profile.

- *Floor Slab Recommendations (Section 5.3)*
  - The floor slab may be designed as slab on grade.

- The floor slab may bear on densified virgin soil or engineer-approved compacted fill.
- The modulus of subgrade reaction is 200 pci.

5.0 BUILDING EVALUATION

We understand that the proposed construction will consist of a new building addition on the east side of the existing school building. The buildings will connect at the northwest and southwest corners of the new addition. The planned finished floor elevation is +520.5. To achieve the finished floor elevation, cuts ranging up to approximately 12 feet are required. The addition is approximately at grade in the northern portion of the site and the cut depth increases toward the southern portion of the new addition. A summary of the boring observations is provided in Table 1 above.

Where adjacent to the existing building, the new building addition foundation must bear at the same elevation as the existing building foundation. Test pits should be performed to evaluate the depth and bearing material of the existing footings. New foundations adjacent to existing foundations are further discussed in Section 5.2 below.

Existing fill was encountered in borings B-2, B-4, and B-5 to depths ranging from 2'0" to 9'0" below the existing ground surface (approximate elevation +522.5 to +523.0). The depth and extent of the existing fill are expected to be variable and may be deeper or shallower in unexplored areas of the site, especially adjacent to the foundation walls of the existing building. The consistency and density of the soil fill are not predictable. Certain areas may contain clean dense soils, while other areas may contain loose material, void spaces, and/or debris. Existing fill creates the possibility of intolerable differential settlements under loading. Therefore, the existing fill is not an acceptable bearing material for the new building foundation or floor slab.

Based on the boring observations and the proposed construction, we anticipate that most of the existing fill will be removed during the excavation to the planned building subgrade elevation. Where existing fill remains below the proposed building subgrade elevation, the existing fill shall be completely removed from the building areas and replaced with new engineer-approved compacted fill as described below.

Recommendations for preparation of the building area are provided in Section 5.1 below. Foundation recommendations for the building are provided in Section 5.2 below. The proposed floor slab may be designed as a slab on grade bearing on new compacted fill or densified virgin soils. Floor slab recommendations can be found in Section 5.3 below.

5.1 New Addition Area Preparation

In order to prepare the site for construction, all surface materials such as topsoil, vegetation, asphalt, and concrete shall be removed from the planned building addition area, extending at least 10 feet beyond the new construction limits, where practical.

As part of the site development, an existing retaining wall on the site will be demolished. All debris resulting from the demolition of this structure must be completely removed from the new building addition area, extending at least 10 feet beyond the new building limits, where practical. This shall include the complete removal of all concrete and miscellaneous debris. Where the removal of existing structures or associated materials extends below the planned building subgrade elevation,

the resulting excavations shall be backfilled with new compacted fill as described in "Installation of New Structural Fill" below.

Where existing utilities are encountered within the planned building area, they should be either abandoned or rerouted around the new structure. Once the utility has been rerouted or abandoned, the section of pipe and any associated structure within the building area should be completely removed. The removal of the pipe and structure must also include any loose fill around the pipe or structure. After the pipe, associated structure, and associated loose backfill have been removed, the resulting excavation shall be backfilled with new controlled fill as described in "Installation of New Structural Fill" below.

Removal of Existing Fill (If Required)

As discussed above, existing fill was encountered in boring B-2, B-4, and B-5 to depths ranging from 2'0" to 9'0" below the existing ground surface (approximate elevation +522.5 to +523.0). The existing fill is not a suitable bearing material for the new building foundation and floor slab. Where existing fill is encountered in the building addition area, it must be completely removed and replaced as described below.

Where existing fill remains below the planned subgrade elevation, the excavation shall extend through the existing fill down to the virgin soil. At the bottom of the excavation, the removal of the unsuitable material shall extend horizontally beyond the building limits a minimum distance of 1'0" plus a distance equal to the depth of the excavation below the planned foundation bearing elevation. For example, if the removal of the existing fill extends vertically 2'0" below the planned foundation bearing elevation, the excavation must extend horizontally a minimum of 3'0" (1'0" plus 2'0") beyond the new building limits at that location.

The removal of the existing fill from the proposed building area shall be performed under the full time inspection of Carlin-Simpson & Associates. The on-site representative from Carlin-Simpson & Associates shall direct the contractor during this operation to ensure that all of the unsuitable material has been removed from the proposed building addition area.

During the removal of the unsuitable material, the contractor should segregate the potentially re-usable existing soil/fill material from the non-reusable fill (i.e. debris and topsoil). The on-site representative from Carlin-Simpson & Associates shall evaluate the suitability of the excavated materials for use as compacted fill during the excavation and prior to its re-use. Potentially usable fill should be stockpiled and covered with tarps or plastic sheeting for protection from excess moisture. Any fill material that is or becomes wet must be dried prior to its re-use.

Densification of Subgrade Soils (Proofrolling)

After the building area has been prepared as outlined above, and prior to the placement of new structural fill (if required), the exposed subgrade soil must be graded level and proofrolled with at least five (5) passes of a large vibratory drum roller (i.e. Dynapac CA 250 or equivalent). The proofrolling is necessary to densify the underlying soils. Proofrolling must be performed prior to the excavation for new foundations and/or the installation of new compacted fill in the building area.

A representative from Carlin-Simpson & Associates shall observe the proofrolling operation. If any excessive movement is noted during the proofrolling, the soft soil shall be removed and

replaced with new compacted fill. The Carlin-Simpson & Associates representative shall be responsible for determining what material, if any, is to be removed and will direct the contractor during this operation.

Installation of New Structural Fill

New fill required to achieve final grades shall consist of either engineer-approved on-site soil or imported sand and gravel. The new fill shall be placed in layers not exceeding 12 inches in loose thickness and each layer shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557). Each layer must be compacted, tested, and approved by the Carlin-Simpson & Associates field representative prior to placing subsequent layers. The suitability of the excavated soil for reuse as compacted structural fill is discussed in Section 6.3 below.

If imported structural fill will be required during construction, the imported structural fill shall meet the following specified gradation:

US Standard Sieve Size	Percent Finer By Weight
3 inch	100
No. 4	30-80
No. 40	10-50
No. 200	0-20

5.2 New Addition Foundations

Once the planned building addition area has been prepared as described Section 5.1 above, the new foundations may be designed as shallow spread footings constructed on the virgin site soils or new compacted fill. The new foundations shall use the net design bearing pressure listed in Table 2 below.

All of the exterior footings shall bear at the minimum depth listed below for protection from frost. Interior column footings may bear on the virgin soil or new structural fill just below the floor slab provided the structure is heated during winter. The footings shall have the minimum dimensions as listed below.

Table 2 – New Foundation Design Parameters

Description	Value
Foundation Bearing Material	Virgin Soil or New Compacted Fill
Net Design Bearing Pressure	4,000 psf
Minimum Frost Depth	48 inches
Minimum Column Dimension	30 inches
Minimum Wall Dimension	18 inches

The excavations for the new foundations shall be performed under the full-time inspection of Carlin-Simpson & Associates. The on-site representative shall confirm that the foundation bearing material is capable of supporting the design bearing pressure.

Prior to the placement of formwork, reinforcement steel, and concrete, the bearing subgrade soil shall be cleaned of all loose soil and where soil is encountered at the subgrade elevation, it shall be compacted with several passes of a small vibratory drum trench compactor (i.e. Wacker Model RT560), a heavy vibratory plate tamper (i.e. Wacker BPU 3545A or equivalent), or "jumping jack" style tamper (i.e. Wacker Model BS 600). This must be performed under the observation of Carlin-Simpson & Associates. If instability is observed during the compaction of the bearing subgrade, the soft soil shall be removed and replaced with new compacted fill.

New Footings Adjacent to Existing Foundations

Where the new footings are planned adjacent to or within the zone of influence of the existing building foundations, the new footings shall bear at the same elevation as the existing footings. This is required to ensure that the new foundation does not surcharge the existing foundation walls and to ensure that the new foundation does not bear on fill placed around the existing foundations or foundation walls. We recommend that a series of test pits be performed adjacent to the existing building to evaluate the existing building foundation, the bearing material, and the extent of existing fill.

In the event that new footings will bear at a lower elevation than the existing foundations, underpinning of the existing foundations will be required. If required, we anticipate that underpinning could be achieved using traditional underpinning techniques by which the area under the existing foundation is excavated and replaced with concrete to lower the existing foundation where necessary.

5.3 Floor Slab on Grade

Where new fill is required for the floor slab, it shall consist of either suitable on-site soil or imported sand and gravel. Imported sand and gravel shall contain less than 20% material by weight passing a No. 200 sieve and meet the gradation specified in Section 5.1 "Installation of New Structural Fill" above. The new fill shall be placed in layers not exceeding 12 inches in loose thickness and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). Fill layers shall be compacted, tested, and approved before placing subsequent layers.

The addition floor slab may be designed as a slab on grade bearing on densified virgin soil or new engineer-approved structural fill. Floor slab design parameters are provided in Table 3 below. A layer of 3/4-inch crushed stone is recommended beneath the concrete slab for additional support and drainage. In addition, permanent sumps and pumps are required for all below grade levels and basements.

Table 3 – Building Floor Slab Design Parameters

Description	Value
Slab Subgrade Material	Densified Virgin Soil or New Compacted Fill
Modulus of Subgrade Reaction (k)	200 pci
Crushed Stone Cushion Thickness	6 inches

5.4 Foundation Walls

Where foundation walls are required, the soil adjacent to the building walls will exert a horizontal pressure against the wall. This pressure is based on the soil density and Coefficient of Earth Pressure at Rest (k_o), which is applicable to non-yielding building walls. Foundation wall design parameters are listed in Table 4 below.

Table 4 – Foundation Wall Design Parameters

Soil Type	On-Site Soils
Moist Unit Weight (γ)	130 pcf
Friction Angle (ϕ, deg)	30
Cohesion (c, psf)	0
Coefficient of Earth Pressure at Rest (k_o)	0.5
Equivalent Fluid Pressure	65 psf/ft
Foundation Sliding Coefficient	0.45

Where foundation walls are required, we recommend that a footing drain be placed around the exterior of the new structure to prevent water from accumulating against the foundation wall. This drain may consist of a minimum 4-inch diameter, rigid wall perforated PVC pipe surrounded by at least 12 inches of 3/4-inch clean crushed stone. The stone shall be wrapped in a geotextile fabric, such as Mirafi 140N or equivalent. The foundation drainpipe should be extended to daylight or to the stormwater collection system. The outside face of the foundation wall, where it extends below grade, shall be waterproofed.

Outside the structure, the backfill placed adjacent to the foundation walls and above the footing drain shall consist of either clean crushed stone or an imported sand and gravel mixture containing less than 5% by weight passing a No. 200 sieve and placed in layers not exceeding 12 inches in thickness. This clean sand and gravel or crushed stone backfill shall extend a minimum of 1 foot horizontally from the back face of the foundation walls, and shall extend vertically up the wall face to 2 feet below the finished ground surface elevation. Where retained soils are not covered by concrete or pavement and are exposed to weather, the top 2 feet of backfill should consist of low permeable soil. This will help to minimize water infiltration behind the wall. Surface grades should be sloped away from the building to prevent water from accumulating adjacent to the wall.

Beyond this point, the foundation walls should be backfilled with suitable soil placed in layers up to 12 inches in loose thickness. The suitability of the on-site soil for reuse as compacted fill is discussed in a separate section below. The new fill should be compacted with a vibratory drum trench compactor (i.e. Wacker Model RT560), a heavy vibratory plate tamper (i.e. Wacker BPU 3545A or equivalent), or “jumping jack” style tamper (i.e. Wacker Model BS 600) to at least 92% of its Maximum Modified Dry Density (ASTM D1557). Heavy equipment should not be operated near the building walls as damage to the walls could occur.

5.5 Settlement

Settlement of individual footings, designed in accordance with recommendations presented in this report, is expected to be within tolerable limits for the proposed structure. For footings placed on natural soils or new compacted fill approved by Carlin-Simpson & Associates and constructed in accordance with the requirements outlined in this report, maximum total settlement is expected to be

on the order of 1-inch or less. Maximum differential settlement between adjacent columns or load bearing walls is expected to be ½-inch or less.

The above settlement values are based on our engineering experience with similar soil conditions and the anticipated structural loading. These estimated settlements are intended to guide the structural engineer with their design. It is critical that Carlin-Simpson & Associates be retained to observe the foundation bearing surfaces and to confirm the recommended bearing pressures during construction.

5.6 Seismic Design Considerations

From site-specific test boring data, the Site Class was determined from Table 1613.2.2 of the New York State Building Code. The site-specific data used to determine the Site Class typically includes soil test borings to determine Standard Penetration resistances (N-values). Based on estimated average N-values in the upper 100 feet of soil profile, the site can be classified as Site Class D – Stiff Soil Profile.

New structures should be designed to resist stress produced by lateral forces computed in accordance with Section 1613 of the New York State Building Code. The values in Table 5 shall be used for this project.

Table 5 – Seismic Design Values

Description	Value
Mapped Spectral Response Acceleration for Short Periods, [Fig 1613.2.1 (1)]	S_S=0.235g
Mapped Spectral Response Acceleration at 1-Second Period, [Fig 1613.2.1 (2)]	S_1=0.057g
Site Coefficient [Table 1613.2.3 (1)]	F_a= 1.60
Site Coefficient [Table 1613.2.3 (2)]	F_v= 2.40
Max Considered Earthquake Spectral Response for Short Periods [Eq 16-36]	S_{MS}=0.376g
Max Considered Earthquake Spectral Response at 1-Second Period [Eq 16-37]	S_{M1}=0.137g
Design Spectral Response Acceleration for Short Periods [Eq 16-38]	S_{DS}=0.251g
Design Spectral Response Acceleration for 1-Second Period [Eq 16-39]	S_{D1}=0.092g

We expect that the proposed addition will be an educational facility with a Group E occupancy, and an occupant load greater than 250. Therefore, the Risk Category of the new addition is III. Based on this assumption, the Seismic Design Category (SDC) is B. The Risk Category and SDC should be verified by the project structural engineer. In the event that the structure has a different Risk Category, the SDC should be updated in accordance with Section 1613 of the New York State Building Code.

Liquefaction Potential

Liquefaction is a phenomenon in which saturated or partially saturated soils lose strength and stiffness when subjected to earthquake-induced ground shaking. Ground shaking of sufficient duration results in the loss of grain-to-grain contact and collapse of the soil skeleton which causes stresses in the soil to be completely transferred to the pore water fluid. Liquefaction is most often observed in saturated, loose sandy soils and non-plastic silty soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and

thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

The liquefaction potential was evaluated with the available boring data, including the SPT blow counts, soil classification, total unit weight, soil fines content, and depth to groundwater. We have determined the potential for liquefaction of the non-cohesive soils below the groundwater table and less than 50 feet below the ground surface is considered unlikely. Therefore, a liquefaction evaluation is not required for the site.

6.0 SITE EVALUATION

Our recommendations for the proposed site development including new utilities, temporary excavations and excavation protection, and suitability of the existing site soils for reuse are provided below. A summary of the boring observations is provided in Table 1 above.

6.1 Utilities

New utilities may bear in the densified existing fill, virgin site soils, and/or new compacted fill. The bottom of all trenches should be excavated clean and shaped so a hard bottom is provided for the pipe support. In the event that any soft or unsuitable soil conditions are encountered during construction, the unsuitable materials must be removed and replaced with new compacted fill.

For areas where existing fill is encountered within the utility excavations, the subgrade at bottom of the utility excavation shall be compacted in place with a vibratory drum trench compactor or "jumping jack" style tamper. Carlin-Simpson & Associates must evaluate these areas for the presence of soft or unsuitable material within the existing fill matrix. If instability is observed, portions of this fill may have to be removed and replaced with new compacted fill. Carlin-Simpson & Associates will determine this during construction.

In the event that water is encountered within the utility trench excavation or if the trench bottom becomes soft due to the inflow of surface water or trapped water, a layer of geotextile filter fabric and a minimum of 6 inches of crushed stone shall be placed on the bearing soil to provide a firm base for support of the pipe. Sump pits and pumps should be used to keep the excavations dry.

After the utility is installed, the trench must be backfilled with compacted fill. The fill shall consist of suitable on-site soil or imported sand. Controlled compacted fill shall be placed in maximum 12-inch loose layers and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). The backfill must be free of topsoil, cobbles, boulders, and debris.

6.2 Temporary Construction Excavations and Excavation Protection

Temporary construction excavations should be conducted in accordance with the most recent OSHA guidelines or applicable federal, state or local codes. A qualified person should evaluate the excavations at the time of construction to determine the appropriate soil type and allowable slope configuration. Based on the boring data, we believe the site soils would have the following classifications as defined by the OSHA guidelines.

Soil Type	Possible Classification	Maximum Slope or Bench
Existing Fill	Type "C"	1½H:1V
Virgin Soil	Type "C" or "B"	1½H:1V or 1H:1V

Temporary support (i.e. trench boxes, sheeting and shoring, etc.) should be used for any excavation that cannot be sloped or benched in accordance with the applicable regulations, where necessary to protect adjacent property, utilities, driveways, and/or structures, or where saturated soils or water seepage is encountered within the excavation. In the event that water is encountered within the excavation, an evaluation of the excavation's stability must be performed. Perched water or groundwater encountered within the excavation will destabilize the sides of the excavation. Temporary support will be required to stabilize the excavation. Dewatering of the excavation will also be required.

A New York State licensed professional engineer must design all temporary and permanent support systems. The contractor will select the shoring type and submit design calculations for the proposed shoring method to Carlin-Simpson & Associates for review.

The soil adjacent to the temporary support system will exert a horizontal pressure against the system. This pressure is based on the soil unit weight, coefficient of active earth pressure, and depth of the excavation. In addition, the surcharge loads from adjacent driveways, construction equipment, or stored materials near the excavation must be incorporated into the design of the support system, as applicable. The design parameters for temporary excavation support systems are listed in Table 6 below.

Table 6 – Temporary Excavation and Shoring Design Parameters

Description	Value
Moist Unit Weight (pcf)	130
Friction Angle (ϕ, deg)	30
Cohesion (c, psf)	0
Active Earth Pressure Coefficient (k_a)	0.33
Equivalent Fluid Pressure (pcf)	42.9
Passive Earth Pressure Coefficient (k_p)	3.0

6.3 Suitability of the In-Situ Soils for Use as Compacted Fill

The suitability of each soil stratum for use as compacted fill is discussed below.

Stratum 1 Topsoil

Topsoil is not suitable for use as compacted fill. During construction, it shall be stripped from the construction areas. The topsoil may be reused in landscape areas or hauled offsite.

Stratum 2 Existing Fill

The existing fill generally consists of coarse to fine SAND, little (to some) Silt, little (to some) coarse to fine Gravel. The majority of the existing fill is suitable for reuse as compacted fill provided that it remains relatively dry for optimum compaction and that any debris and organic material have been removed prior to its reuse.

Stratum 3 Silty Sand — The virgin silty sand consists of coarse to fine SAND, little (to and) Silt, trace (to little) medium to fine Gravel. This stratum has a moderate to high percentage of silt and will be very moisture sensitive. If the soil becomes too wet, it will be difficult to achieve adequate compaction. This stratum is generally suitable for use as compacted fill provided that it remains relatively dry for optimum compaction prior to its use.

Stratum 4 Clayey Silt — The clayey silt consists of Clayey SILT trace (to some), coarse to fine Sand, trace (to little) medium to fine Gravel. This stratum has a high percentage of silt/clay and will be very moisture sensitive. If the soil becomes too wet, it will be difficult to achieve adequate compaction. This stratum is generally suitable for use as compacted fill provided that it remains relatively dry for optimum compaction prior to its use and meets the project gradation specifications.

The boring observations indicate that the on-site soils contain a varying percentage of silt and clay (15% to greater than 70%). The moderate to high silt/clay content soils will be moisture sensitive. If the soil becomes too wet, it will be difficult to achieve adequate compaction. In addition, the site soils that extend below the groundwater table are completely saturated and therefore, unsuitable for reuse.

Proper moisture conditioning of the soil will be required. New compacted fill should be within 2% (+/-) of its optimum moisture content at the time of placement. In the event that the on-site material is too wet at the time of placement and cannot be adequately compacted, the soil should be aerated and allowed to dry or the material removed and a drier cleaner fill material used. Given the silty/clayey nature of the site soils, drying could take a considerable amount of time. In the event that the on-site material is too dry at the time of placement and cannot be adequately compacted, water may be needed to increase the soil moisture content for proper compaction.

The minimum compaction requirements for the various areas of the site are summarized in Table 7 below.

Table 7 - Minimum Compaction Requirements

Area	Maximum Modified Dry Density (ASTM D1557)
Building (below foundations)	95%
Building Slab (above foundations)	92%
Adjacent to Foundation Walls	92%
Exterior Slabs and Sidewalks	92%
Utility Trenches	92%
Landscape Areas	90%

7.0 GENERAL

The findings, conclusions and recommendations presented in this report represent our professional opinions concerning subsurface conditions at the site. The opinions presented are relative to the dates of our site work and should not be relied on to represent conditions at later dates or at locations not explored. The opinions included herein are based on information provided to us, the data obtained at specific locations during the study and our past experience. If additional

information becomes available that might impact our geotechnical opinions, it will be necessary for Carlin-Simpson & Associates to review the information, reassess the potential concerns, and re-evaluate our conclusions and recommendations.

Regardless of the thoroughness of a geotechnical exploration, there is the possibility that conditions between borings and test pits will differ from those encountered at specific boring or test pit locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process have altered the subsurface conditions. These variations are an inherent risk associated with subsurface conditions in this region and the approximate methods used to obtain the data. These variations may not be apparent until construction.

The professional opinions presented in this geotechnical report are not final. Field observations and floor slab installation monitoring by the geotechnical engineer, as well as soil density testing and other quality assurance functions associated with site earthwork and floor slab construction, are an extension of this report. Therefore, a qualified geotechnical engineer should be retained by the owner to observe all earthwork, foundation, and floor slab construction, to document that the conditions anticipated in this study actually exist, and to finalize or amend our conclusions and recommendations. Carlin-Simpson & Associates is not responsible or liable for the conclusions and recommendations presented in this report if Carlin-Simpson & Associates does not perform the observation and testing services.

In order to preserve continuity in this project, the owner shall retain the services of Carlin-Simpson & Associates to provide full-time geotechnical related monitoring and testing during construction. At a minimum, this shall include the observation and testing of the following: 1) the removal of existing fill and unsuitable soil, where required; 2) the proofrolling of the subgrade soil prior to the placement of new compacted fill; 3) the placement and compaction of controlled fill; 4) the excavation for the new foundations; and 5) the preparation of the subgrade for the floor slab area.

This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty is expressed or implied. The evaluations and recommendations presented in this report are based on the available project information, as well as on the results of the exploration. Carlin-Simpson & Associates should be given the opportunity to review the final drawings and site plans for this project to determine if changes to the recommendations outlined in this report are needed. Should the nature of the project change, these recommendations should be re-evaluated.

This report is provided for the exclusive use of Enviroscience Consultants and the project specific design team and may not be used or relied upon in connection with other projects or by other third parties. Carlin-Simpson & Associates disclaims liability for any such third party use or reliance without express written permission. Use of this report or the findings, conclusions or recommendations by others will be at the sole risk of the user. Carlin-Simpson & Associates is not responsible or liable for the interpretation by others of the data in this report, nor their conclusions, recommendations or opinions.

If the conditions encountered during construction vary significantly from those stated in this report, this office should be notified immediately so that additional recommendations can be made.

Thank you for allowing us to assist you with this project. Should you have any questions or comments, please contact this office.

Very truly yours,

CARLIN-SIMPSON & ASSOCIATES, LLC

MICHAL WROBLEWSKI, P.E.
Project Engineer

ROBERT B. SIMPSON, P.E.
Principal

File No. 23-83

GENERAL NOTES:

1. GENERAL LAYOUT WAS OBTAINED FROM A DRAWING BY INSITE, ENTITLED "PACKAGE 2, SITE PLAN", DATED 8-15-2023, DRAWING NO. CVS C301.
2. BORING LOCATIONS WERE LAID OUT IN THE FIELD BY CSA.
3. BORINGS WERE PERFORMED BY SOIL TESTING INC. IN JULY 2023 UNDER THE FULL TIME INSPECTION OF CSA.
4. LOCATIONS ARE APPROXIMATE.

LEGEND:

- BORING LOCATION

ROBERT B. SIMPSON, P.E.
PROFESSIONAL ENGINEER

BORING LOCATION PLAN

PROPOSED ADDITION
CV STARR INTERMEDIATE SCHOOL BUILDING
20 FARM TO MARKET ROAD
BREWSTER, NEW YORK

DRAWN: MW	SCALE: 1' = 40'
CHECKED: RBS	DATE: 21 AUG 23
PROJECT NO.: 23-83	DWG NO.: FIG - 1
APPROVED:	

CARLIN-SIMPSON AND ASSOCIATES, LLC
61 Main Street
Sayreville, NJ 08872

Consulting Geotechnical and Environmental Engineers

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.					TEST BORING LOG					BORING NUMBER B-1
Project: Prop Addition, CV Starr School Bldg, Brewster, NY										SHEET NO.: 1 of 2
Client: Enviroscience Consultants										JOB NUMBER: 23-83
Drilling Contractor: Soil Testing Inc										ELEVATION: +527.0
GROUNDWATER						CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING		TYPE	HSA	SS			START DATE: 17/Jul/23
17/Jul/23	1030	11'0"	None		DIA.	4 1/4"	1 3/8"			FINISH DATE: 17/Jul/23
					WGHT		140#			DRILLER: Andy
					FALL		30"			INSPECTOR: KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			2			
1			1		**Brown topsoil** 0'10"	
		S-1	2		Gr br cf S, s (-) $	Rec = 17"
2			3			moist
			2		**Gray brown coarse to fine SAND,**	
3		S-2	3		**some (-) Silt**	Rec = 13"
			5		same, t mf G	moist
4			6			
					4'6"	
5						
			1			
6		S-3	19		Gr br Cy $ s, cf S, t mf G	Rec = 13"
			4			moist
7			4			
			3			
8		S-4	4		same	Rec = 20"
			9			moist
9			9			
10						
			5			
11		S-5	10		same	Rec = 16"
			10		**Gray brown Clayey SILT some,**	moist
12			14		**coarse to fine Sand, trace medium**	
					to fine Gravel	
13						
14						
15						
			6			
16		S-6	9		same	Rec = 20"
			11			moist
17			13			
18						
19						
20						
			6			
21		S-7	9		same	Rec = 22"
			11			moist
22			14			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-1
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		SHEET NO.: 2 of 2
Client: Enviroscience Consultants		JOB NUMBER: 23-83

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24						
25						
26		S-8	15 8 9	■	Gr Cy $ l (+), cf S, t (-) f G	Rec = 17" moist
27			13	■		
28						
29						
30						
31		S-9	4 5	■	same	Rec = 23"
32			8 16	■	**Gray brown Clayey SILT some, coarse to fine Sand, trace medium to fine Gravel**	moist
33						
34						
35						
36		S-10	10 10	■	same	Rec = 17"
37			9 50/2"	■		moist Boulder
38						
39						
40						
41		S-11	7 8	■	same	Rec = 20"
42			13 13	■	42'0"	
43					**End of Boring @ 42'0"**	
44						
45						
46						
47						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-2
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		**SHEET NO.:** 1 of 2
Client: Enviroscience Consultants		**JOB NUMBER:** 23-83
Drilling Contractor: Soil Testing Inc		**ELEVATION:** +525.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 17/Jul/23
17/Jul/23	1430	9'0"	HSA	DIA.	3 1/4"	1 3/8"			FINISH DATE: 17/Jul/23
				WGHT		140#			DRILLER: Andy
				FALL		30"			INSPECTOR: KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1		**Brown topsoil** 0'5"	
1		**S-1**	2		FILL (Br cf S, s $, l cf G)	Rec = 11"
			3		**FILL (Brown coarse to fine SAND,**	moist
2			2		**some Silt, little coarse to fine Gravel)** 2'0"	
			3			
3		**S-2**	2		Br cf S, l (-) $, t f G	Rec = 11"
			2		**Brown coarse to fine SAND, little (-) Silt,**	moist-wet
4			1		**trace fine Gravel** 4'0"	
5						
			2			
6		**S-3**	3		Br gr Cy $ s, cf S, t f G	Rec = 14"
			2			moist-wet
7			4			
			1			
8		**S-4**	2		same, l mf G	Rec = 15"
			3			wet
9			3			
10						
			14			
11		**S-5**	8		same, w/rk frag	Rec = 21"
			19			wet
12			17		**Brown gray Clayey SILT, some**	
13					**coarse to fine Sand, little medium**	
					to fine Gravel	
14						
15						
			9			
16		**S-6**	15		same	Rec = 14"
			14			wet
17			15			
18						
19						
20						
			3			
21		**S-7**	5		same	Rec = 20"
			8			wet
22			12			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-2
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		SHEET NO.: 2 of 2
Client: Enviroscience Consultants		JOB NUMBER: 23-83

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24						
25						
26		S-8	5 6 9 12	■	Br gr Cy $ s, cf S, l mf G	Rec = 24" wet
27						
28						
29						
30						
31		S-9	5 14 8 14	■	same	Rec = 20" wet
32					**Brown gray Clayey SILT, some coarse to fine Sand, little medium to fine Gravel**	
33						
34						
35						
36		S-10	6 9 11 13	■	same	Rec = 24" wet
37						
38						
39						
40						
41		S-11	4 11 40/2"	■	same 41'2"	Rec = 12" wet
42					**End of Boring @ 41'2"**	Spoon refusal 41'2"
43						
44						
45						
46						
47						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-3
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		**SHEET NO.:** 1 of 2
Client: Enviroscience Consultants		**JOB NUMBER:** 23-83
Drilling Contractor: Soil Testing Inc		**ELEVATION:** +520.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 18/Jul/23
18/Jul/23	1030	8'3"	None	DIA.	4 1/4"	1 3/8"			FINISH DATE: 18/Jul/23
18/Jul/23	1230	6'8"	None	WGHT		140#			DRILLER: Andy
18/Jul/23	1315	4'9"	None	FALL		30"			INSPECTOR: KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1		**Brown topsoil** 0'6"	
1		**S-1**	4		Br cf S, l (+) $, t mf G	Rec = 18"
			4		**Brown coarse to fine SAND, little Silt,**	moist
2			8		**trace medium to fine Gravel** 2'0"	
			4			
3		**S-2**	4		Mttld gr, br Cy $ l, cf S, t f G	Rec = 22"
			4			moist
4			4			
					Gray Clayey SILT some, coarse to	
5					**fine Sand, trace fine Gravel**	
			2			
6		**S-3**	1		Gr Cy $ l, cf S	Rec = 19"
			4			wet
7			5			
			6			
8		**S-4**	6		same, l (+) cf S, t (-) f G	Rec = 22"
			11			wet
9			11			
10						
			5			
11		**S-5**	12		same 11'0"	Rec = 18"
			21		Gr cf S, a $, s (-) cf G	moist
12			17			
					Gray coarse to fine Sand, and Silt,	
13					**some coarse to fine Gravel**	
14					14'0"	
15						
			6			
16		**S-6**	8		Gr Cy $ s, cf S, t (-) f G	Rec = 22"
			10			moist
17			13			
18						
					Gray Clayey SILT some, coarse to	
19					**fine Sand, trace fine Gravel**	
20						
			20			
21		**S-7**	12		same, l (+) cf G	Rec =
			12			
22			13			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-3
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		SHEET NO.: 2 of 2
Client: Enviroscience Consultants		JOB NUMBER: 23-83

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24						
25						
26		S-8	5 7		Gr Cy $ s (-), cf S	Rec = 23"
27			10 13		moist **Gray Clayey SILT some, coarse to fine Sand, trace fine Gravel**	
28						
29						
30						
31		S-9	4 10		same	Rec = 24"
32			14 17		32'0"	moist
33					**End of Boring @ 32'0"**	
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-4
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		**SHEET NO.:** 1 of 2
Client: Enviroscience Consultants		**JOB NUMBER:** 23-83
Drilling Contractor: Soil Testing Inc		**ELEVATION:** +525.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 18/Jul/23
18/Jul/23	1230	10'0"	None	DIA.	3 1/4"	1 3/8"			FINISH DATE: 18/Jul/23
				WGHT		140#			DRILLER: Andy
				FALL		30"			INSPECTOR: KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1			
1			1		**Brown topsoil** 1'0"	
		S-1	3		FILL (Gr, br cf S, l (+) $)	Rec = 16"
2			6		**FILL (Gray, brown coarse to fine SAND,**	moist
			4		**little (+) Silt)** 2'6"	
3		S-2	10		Mttld gr, br cf S, a $	Rec = 22"
			5		**Mottled gray, brown coarse to fine SAND,**	moist
4			5		**and Silt**	
					4'6"	
5						
			2		Gr Cy $ s (-), cf S	
6		S-3	2			Rec = 20"
			3		**Gray Clayey SILT some (-), coarse**	moist
7			4		**to fine Sand**	
			3			
8		S-4	6		same 8'0"	Rec = 18"
			12		Gr Cy $ s, cf S, l cf G	moist
9			13			
10						
			6			
11		S-5	10		Gr $ s, cf S	Rec = 20"
			13			wet
12			15			
13						
					Gray Clayey SILT some, coarse to fine	
14					**Sand, little coarse to fine Gravel**	
15						
			20			
16		S-6	17		same, l cf G	Rec = 19"
			19			wet
17			30			
18						
19						
20						
			7			
21		S-7	9		Gr Cy $ l (+), cf S, t (-) cf G	Rec = 20"
			13			wet
22			16			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-4
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		SHEET NO.: 2 of 2
Client: Enviroscience Consultants		JOB NUMBER: 23-83

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24						
25						
26		S-8	5 7 11 22	■	Gr Cy $ s, cf S, t f G	Rec = 20" wet
27						
28						
29					**Gray Clayey SILT some, coarse to fine Sand, trace fine Gravel**	
30						
31		S-9	12 10 15 17	■	same	Rec = 18" wet
32						
33						
34						
35						
36		S-10	7 12 22 22	■	same	Rec = 20" wet
37					37'0"	
38					**End of Boring @ 37'0"**	
39						
40						
41						
42						
43						
44						
45						
46						
47						

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-5
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		SHEET NO.: 1 of 2
Client: Enviroscience Consultants		JOB NUMBER: 23-83
Drilling Contractor: Soil Testing Inc		ELEVATION: +532.0

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: Topo
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 19/Jul/23
No Groundwater Reading				DIA.	3 1/4"	1 3/8"			FINISH DATE: 19/Jul/23
				WGHT		140#			DRILLER: Andy
				FALL		30"			INSPECTOR: MC

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
			1		**Black topsoil** 0'4"	
1		**S-1**	1		FILL (Br cf S, s (+) $, l (+) mf G, w/t roots)	Rec = 15"
			2			moist
2			5			
			4			
3		**S-2**	6		FILL (same, rd br, gr)	Rec = 21"
			7			moist
4			6		**FILL (Brown coarse to fine SAND, some (+) Silt, little (+) medium to fine Gravel, with trace roots)**	
5						
			.WOH			
6		**S-3**	.WOH		FILL (same, s cf G)	Rec = 17"
			3			very moist
7			5			
			5			
8		**S-4**	7		FILL (Br cf S, s (+) $, s cf G)	Rec = 24"
			7			moist
9			8		9'0"	wet auger
10						
			2			
11		**S-5**	3		Gr Cy $ s (+), cf S, t mf G	Rec = 24"
			4			wet
12			6			
13						
14					**Gray Clayey SILT some (+), coarse to fine Sand, little medium to fine Gravel**	Auger up old electrical wires
15						
			9			
16		**S-6**	10		same, l mf G	Rec = 24"
			11			wet
17			15			quartz boulder
			13			
18		**S-7**	13		same	Rec = 20"
			13			wet
19			15			
20						quartz boulder
			35			
21		**S-8**	14		same	Rec =
			14			wet
22			15			

CARLIN - SIMPSON & ASSOCIATES Sayreville, N.J.	TEST BORING LOG	BORING NUMBER B-5
Project: Prop Addition, CV Starr School Bldg, Brewster, NY		SHEET NO.: 2 of 2
Client: Enviroscience Consultants		JOB NUMBER: 23-83

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION	REMARKS
23						
24						
25						
26		S-9	7 15		same, s mf G	Rec = 24"
27			13 13			wet
28						
29					**Gray Clayey SILT some (+), coarse to fine Sand, little medium to fine Gravel**	
30						
31		S-10	7 8		same, w/rk frag	Rec = 24"
32			8 10			wet
33						
34						
35						
36		S-11	7 7		same	Rec = 24"
37			7 9		37'0"	wet
38					**End of Boring @ 37'0"**	
39						
40						
41						
42						
43						
44						
45						
46						
47						

CV Starr Utility Markouts

Legend

- ELEC_CONTINUES
- ELEC_EQUIPMENT 12
- ELECTRICAL LINE
- ELECTRICAL LINE
- NATIONAL WILDLIFE REFUGE
- SAN_CLEANOUT
- SAN_CONTINUES
- SAN_MANHOLE
- SAN_VENT 54
- SANITARY
- SANITARY
- SCAN AREA 1
- SCAN AREA 57 vertex
- STORM LINE
- STORM LINE
- STRM_CATCHBASINSQUARE
- STRM_CONTINUES
- STRM_EOI 68
- STRM_MANHOLE
- UNKN_EOI
- UNKN_MANHOLE
- UNKNOWN
- UNKNOWN
- WATER LINE
- WATER LINE
- WTR_CONTINUES
- WTR_VALVE

100 ft

N

JOB SUMMARY

Service Completed Date: 07/16/2023

Customer: ENVIROSCIENCE CONSULTANTS INC **Phone Number:**

Billing Address	City	State	Zip
2150 SMITHTOWN AVE	RONKONKOMA	NY	11779

Job Details

Jobsite Location	City	State	Zip
20 Farm To Market Road	Brewster Hill	NY	10509

Work Order Number 569414-74383 **Customer Service Phone Num**

Job Num **PO Num**

Project Manager: David Gutierrez **Email:** David.GUTIERREZ@gprsinc.com

Thank you for using GPRS on your project. We appreciate the opportunity to work with you. If you have questions regarding the results of this scanning, please contact the lead GPRS technician on this project.

EQUIPMENT USED

The following equipment was used on this project:

- **Underground GPR Antenna:** This GPR Antenna uses frequencies ranging from 250 MHz to 450 MHz and is mounted in a stroller frame that rolls over the surface. Data is displayed on a screen and marked in the field in real-time. The surface needs to be reasonably smooth and unobstructed to obtain readable scans. Obstructions such as curbs, landscaping, and vegetation will limit the efficacy of GPR. The total effective scan depth can be as much as 8' or more with this antenna but can vary widely depending on the soil conditions and composition. Some soil types, such as clay, may limit maximum depths to 3' or less. As depth increases, targets must be larger to be detected, and non-metallic targets can be challenging to locate. The depths provided should always be treated as estimates as their accuracy can be affected by multiple factors. For more information, please visit: Link
- **EM Pipe Locator:** Electromagnetic Pipe and Cable Locator. Detects electromagnetic fields. Used to actively trace conductive pipes and tracer wires, or passively detect power and radio signals traveling along conductive pipes and utilities. For more information, please visit: Link
- **Traceable Rodder:** The rodder has a copper wire encased in fiberglass. The device is pushed through accessible pipes before placing a current on the wire, and the signal is then traced from the surface. The maximum traceable depth is 10' depending on the soil conditions, and the maximum distance is 200'. The line can be pushed through a pipe with direct access, such as a sewer line at a cleanout or a storm drain catch basin. It may not be able to be pushed through deeper pipes within manholes. GPRS will not access electrical conduits. The signal cannot be located through metallic pipes. For more information, please visit:

JOB SUMMARY

WORK PERFORMED

GPRS performed the following work on this project:

UNDERGROUND UTILITY

- The total area scanned was approximately 3 acres.
- The effective depth of GPR will vary throughout a site depending on a variety of factors such as surface type, surface conditions, soil type, and moisture content. At this site, the maximum effective GPR depth was approximately 2 feet.

RESULTS AND NOTES

Located Utilities	Electric, Water, Storm Sewer, Sanitary Sewer, Unknown
Limitations Encountered	Surface Obstructions, Utilities were to deep to locate, Soil conditions not suitable for GPR at time of scanning, RF Interference
Additional Notes	GPRS was tasked to scan and mark out all utilities within the Scope of Work (SOW). The SOW consisted of a C V Starr Intermediate School in Brewster, NY. Scanning was conducted with a mixture of Ground GPR Antenna, EM Pipe Locator and Traceable Duct Rodder. The EM Pipe Locator was used in several modes such as Passive mode, Active or Direct Connection, Induction Clamp, and dropping the transmitter on marked lines. In Active Mode, GPRS connected the EM Transmitter to all available surface features and traced the line to completion, to another surface feature, outside the SOW, or to End of Information (EOI/?). Proceed with caution near items marked with "EOI/?" as these items may continue past the EOI Point. Where possible, an approximate subsurface depth was placed on each line. GPR max effective range was about 2'. Some lines in or near the scope were previously marked out by another entity with spray paint and pin flags. Water, sanitary sewer, storm, electric, and unknown lines were located and marked in the SOW in their industry standard colors and pin flagged where possible. Several sewer manholes were opened to reveal a second concrete lid which could not be opened. The area which these manholes were in was boxed out in pink and it was relayed to the client to avoid this area as the lines could not be traced with the rodder and were too deep for GPR. One electrical line was observed coming from the ground and into the building but no tone could be traced. Several methods were used but to no avail. Two other manholes near the basketball courts were opened to reveal that the structure had been back filled to the top. Several unknown lines were also located in the SOW as they could not be traced to a source and several were labeled with "EOI" as the tone was lost. Items located with Passive mode are unable to be accurately provided with a depth. Items identified with Passive mode are labelled "Passive" on the .KMZ map and marked in Red/Pink. GPRS encountered slight interference throughout the site in Passive mode it is possible that this impacted scan results, proceed with caution. Limitations consisted of not being able to locate certain lines due to their material makeup, no tracer wires to connect to, soil conditions not suitable for GPR, RF interference, restricted access, uneven surface, saturated ground, not enough features to connect to, utilities too deep to locate, and obstructions on the surface. GPR could not scan within 2' of any wall or obstructions. GPRS advises client to stay off any marked lines by 2' on each side and to hand dig to verify utilities.

Client performed 811 Location Request:	No	Unlocatable Utility Types:	Communication, Natural Gas
Findings Walkthrough done with client:	Yes	Marking Medium:	Spray Paint, Flags

JOB SUMMARY

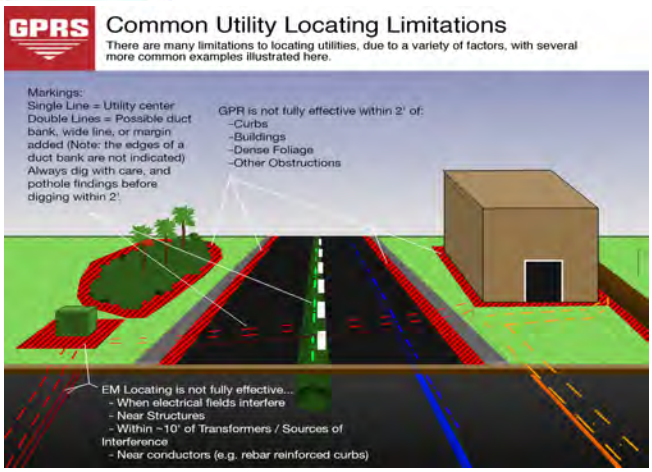
Image 1

Image 2

Image 3

Image 4

JOB SUMMARY



CONTACT / SIGNATURE INFORMATION

TERMS & CONDITIONS

http://www.gprsinc.com/termsandconditions.html

SIGNATURE

CONTACT NAME

KATHRYN LODDENGAARD 631-793-1485

Photographic Documentation
CV Starr Intermediate School, Brewster, NY
Geotechnical Soil Borings
July 17, 2023 Day-1

View of boring B-1 from surface to feet to 2 feet.

View of boring B-1 from 2 feet to 4 feet.

View of boring B-1 from 5 feet to 7 feet.

View of boring B-1 from 7 feet to 9 feet.

View of boring B-1 from 10 feet to 12 feet.

View of boring B-1 from 15 feet to 17 feet.

View of boring B-1 from 20 feet to 22 feet.

View of boring B-1 from 30 feet to 32 feet.

View of boring B-1 from 35 feet to 36.5 feet.

View of boring B-1 from 40 feet to 42 feet.

View of boring B-2 from surface to feet to 2 feet.

View of boring B-2 from 2 feet to 4 feet.

View of boring B-2 from 5 feet to 7 feet.

View of boring B-2 from 7 feet to 9 feet.

View of boring B-2 from 10 feet to 12 feet.

View of boring B-2 from 15 feet to 17 feet.

View of boring B-2 from 20 feet to 22 feet.

View of boring B-2 from 25 feet to 27 feet.

View of boring B-2 from 30 feet to 32 feet.

View of boring B-2 from 35 feet to 37 feet.

View of boring B-2 from 40 feet to 42 feet.

Limited Environmental Survey

Brewster Central School District
30 Farm to Market Road
Brewster, NY 10509

Package 2 Survey

C.V. Starr Intermediate School
20 Farm to Market Road
Brewster, NY 10509

NOVEMBER 2023

ENVIROSCIENCE CONSULTANTS
A Mainline Company
2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ASBESTOS, LEAD & PCB SURVEY REPORT

Package 2 Survey

C.V. Starr Intermediate School

20 Farm to Market Road

Brewster, NY 10509

November 2023

Enviroscience Project No. 24040

Prepared for: Brewster Central School District
30 Farm to Market Road
Brewster, NY 10509

Prepared by: ENVIROSCIENCE CONSULTANTS, LLC
2150 Smithtown Avenue
Ronkonkoma, NY 11779
(631) 580-3191

37 Moore Avenue
Mount Kisco, NY 10549
(914) 864-1699

Asbestos / Lead Inspector: *Drew Cheskin*
Drew Cheskin NYS Asbestos Certificate: 23-61X9V-SHAB
NYS/EPA Lead Risk Assessor: LBP-R-11931-1

Asbestos / Lead Inspector: *Wade Coble*
Wade Coble NYS Asbestos Certificate: 23-07005
NYS/EPA Lead Risk Assessor: LBP-R-I219351-1

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

Brewster Central School District retained Enviroscience Consultants, LLC to conduct limited asbestos containing materials (ACM), Lead-based paint (LBP) and Polychlorinated Biphenyls (PCBs) surveys throughout the district. These surveys are based on designs created by Fuller and D'Angelo, P.C. for renovations, repairs and upgrades to schools throughout the district. The purpose of these surveys is to identify and quantify ACM, LBP and PCBs that may be affected by proposed work within each building.

The Package 2 survey (C.V. Starr Intermediate School) was performed on August 17th & November 3rd, 2023, and was based upon written and verbal communications with Fuller and D'Angelo architect William Means. While scope of work and architectural, renovation, demolition or proposed construction plans were provided, additional sampling may be required should Package 2 work extend beyond or change from the current scope of work.

The results of the visual inspection and bulk sample analysis determined that the following suspect ACM, LBP and PCB materials may be impacted by the proposed renovations associated with Package 2 (C.V. Starr Intermediate School).

Asbestos

Analytical results of the bulk samples collected by Enviroscience Consultants, LLC indicate that the following materials **contain asbestos** (greater than 1-percent);

- None

The following materials were not sampled, but are **presumed to contain asbestos** (greater than 1-percent) based on historical testing of similar materials;

- None

For each survey conducted, the inspector classifies ACM or Assumed ACM materials by friability and condition. This helps to determine the extent of damage in certain areas as well as the potential for further damage and Asbestos release due to disturbance of the material.

Material Location	Material	Quantity	Friability	Condition
N/A	N/A	N/A	N/A	N/A

Condition Definitions:

Good: None/Minimal apparent damage to ACM

Fair: Up to 10% localized damage or up to 25% of the entire ACM is damaged

Poor: Over 10% localized damage or over 25% of the entire ACM is damaged

Asbestos-containing materials (ACM) may only be removed or disturbed by a certified and licensed asbestos abatement contractor. Project monitoring for asbestos abatement projects by an independent air-monitoring firm under contract of the Owner is required, with air sampling being required for most projects. All other materials tested negative for asbestos.

Lead

An EPA certified lead risk assessor used an X-ray Fluorescence (XRF) analyzer to inspect the building in accordance with the New York State Education Department requirements and the US Housing and Urban Development Agency Guidelines for the Evaluation and Control of Lead-based Paint in Housing, Chapter 7, Lead-based Paint Inspection, 1997 Revision. OSHA requires Lead in Construction training for personnel that handle materials containing lead in any amount.

The following surfaces were identified with lead levels above the HUD Guideline definition of greater than 1.0 milligram per square centimeter (mg/cm^2):

- None

A full list of components sampled as part of the Lead-based Paint Survey is included in Section 3.0.

Polychlorinated Biphenyls (PCB)

All suspect materials sampled during this inspection were non-PCB containing.

2.0 ASBESTOS SURVEY

2.1 Asbestos Survey Procedures

The asbestos survey was designed to meet all requirements specified in the *NYS Asbestos Code Rule, 12 NYCRR Part 56, Subpart 56-5.1 Asbestos Survey Requirements for Building/Structure Demolition, Renovation, Remodeling and Repair*. The asbestos survey was conducted by New York State certified asbestos inspectors. Sample analysis was performed by Enviroscience Consultants, LLC, a New York State Department of Health Environmental Laboratory Approval Program accredited laboratory.

New York State requires that the asbestos survey information be transmitted by the building owner as follows:

- One copy of the completed asbestos survey shall be sent by the owner or their agent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under applicable State or local laws.
- The completed asbestos survey for controlled demolition or pre-demolition asbestos projects shall also be submitted to the appropriate Asbestos Control Bureau district office.
- The completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, throughout the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

Enviroscience performed a site investigation of target areas within the building that included a visual inspection of all accessible areas designated for renovation. Material systems were assigned into groups of homogeneous materials. A homogeneous material is defined as a material that is alike in color and texture that was installed at the same time. Samples were then collected from each homogeneous area according to USEPA AHERA requirements. Based upon sample results, each sampled homogeneous area was classified as either asbestos or non-asbestos containing. An asbestos containing material is defined by the USEPA as a material containing greater than one percent asbestos by weight.

New York State certified Asbestos Inspectors Drew Cheskin (cert. #23-61X9V-SHAB) and Wade Coble (cert. #23-07005) conducted the survey on August 17th & November 3rd, 2023. Certifications are provided in Appendix G. The inspectors entered all accessible areas to identify and sample suspect asbestos containing materials. Please reference Asbestos Bulk Sample Location Drawings in Appendix B. Asbestos-containing materials (ACM) are noted above in the Executive Summary and in this section. Also reference the Asbestos Bulk Sample Results in Appendix A and Asbestos Containing Materials Location Drawings in Appendix C, if applicable.

Photographs in Appendix F are typical and do not show all of the asbestos materials that they represent.

Any asbestos containing materials that will be disturbed during renovation or demolition must be removed by a New York State certified and licensed asbestos abatement contractor. Air monitoring is required for most asbestos projects.

Analytical results of the bulk samples collected by Enviroscience Consultants, LLC indicate that the following materials are **classified as non-asbestos containing** (less than or equal to 1-percent) and may be removed or disturbed as regular construction materials:

- Fritz Tile, White w/Gray (Corridor 170 & @ Exit E)
- Adhesive to White w/Gray Fritz Tile (Corridor 170 & @ Exit E)
- Ceramic Wall Tile Mortar, White/Gray (Corridor 170 & @ Exit E)
- Exterior Window/Door Frame Caulk, White/Gray (Corridor 170 & @ Exit E)
- Roof Membrane, Gray (Exit E Overhang)
- Perlite Insulation, Cream (Exit E Overhang)
- Exterior Brick Mortar, Brown (Exit E)
- Expansion Joint Caulk, Pink (Exit E)
- Gypsum Board, White (Corridor 170 & @ Exit E)
- Joint Compound, White (Corridor 170 & @ Exit E)
- Gypsum Board, White (Rooms 015 & 146)
- Joint Compound, White (Rooms 015 & 146)
- 12"x12" Floor Tile, Yellow (Rooms 015 & 146)
- 12"x12" Floor Tile, Blue (Rooms 015, 146 & Cafeteria)
- 12"x12" Floor Tile, White (Rooms 015, 146 & Cafeteria)

- Mastic to 12"x12" Yellow, Blue & White Floor Tiles, Black (Rooms 015, 146 & Cafeteria)
- Exterior Window/Expansion Joint Caulk, Gray (Rooms 015 & 146)
- Exterior Brick Mortar, Brown (Rooms 015 & 146)
- Cove Base, Blue (Rooms 015, 146 & Cafeteria)
- Mastic to Blue Cove Base, Cream (Rooms 015, 146 & Cafeteria)
- Exterior Window/Expansion Joint Caulk, White/Gray (Cafeteria)
- Ceramic Floor Tile Mortar, Gray (Cafeteria Kitchen)
- Ceramic Floor Tile Backing, Brown (Cafeteria Kitchen)
- Spray-on Fireproofing, Gray (Rooms 015, 146 & Cafeteria)

Refer to the Bulk Sample Results #36701 for detailed sample information.

Previous testing performed by Louis Berger in 2013, under project CKL500G1, determined all ceiling tiles within the school to be non-asbestos containing.

The following materials are **classified as non-suspect** (not considered suspect asbestos containing materials by EPA or NYS DOL) and may be removed or disturbed as regular construction materials:

- Brick
- CMU
- Concrete
- Fiberglass Pipe Insulation w/Hard Fiberglass Elbows
- Rubber/Vinyl Wire Insulation
- Stone

The following **locations were not inspected** due to inaccessibility, the destructive nature of the testing and inability to repair the building component, live electrical or active mechanical components, or by directive of the client. Should work in these areas reveal previously un-sampled suspect asbestos containing materials, these materials must be **assumed asbestos containing** and all activities in the area(s) must stop immediately until proper sample collection and laboratory analysis has been performed:

- No penetrations were made into exterior facades

2.2 Asbestos Sampling Procedures

Samples of suspect asbestos materials were collected in accordance with United States Environmental Protection Agency guidelines as outlined below. These sampling procedures were implemented in an effort to minimize the release of asbestos fibers during sampling and to provide control of samples through analysis and reporting.

- Samples were collected in unoccupied areas.
- Surfaces of the material to be sampled were wetted with water mist prior to collection.
- Samples were collected with a cork borer, knife, or other approved sampling tool.
- Sampling tools were decontaminated between each sample.
- Individual sealable containers were used to contain each of the collected samples.
- Samples were double-bagged for transportation to the laboratory.
- Sample containers were labeled with a date and unique sample ID number using a permanent marker.

At the completion of sampling activities, bulk samples were relinquished to the laboratory for analysis. Enviroscience Consultants, LLC is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program accredited environmental testing laboratory (ELAP #11681). The laboratory is also accredited by the National Voluntary Laboratory Accreditation Program, (NVLAP Lab Code 200531-0).

All asbestos bulk samples were analyzed by Polarized Light Microscopy (PLM). Samples of cellulose ceiling tiles, and non-friable organically bound (NOB) materials such as floor tiles and roofing material, that were found to contain less than 1% asbestos by PLM were then analyzed using Transmission Electron Microscopy (TEM). According to the Department of Health, NOB materials may first be analyzed by PLM. If asbestos is not found using PLM, the sample must be analyzed with the higher-powered transmission electron microscope.

3.0 LEAD-BASED PAINT INSPECTION

3.1 Lead Inspection Procedures

Enviroscience Consultants, LLC conducted a limited Lead-based Paint Inspection throughout select locations Brewster High School as part of the Package 1 survey. The purpose of the limited Lead-based Paint Inspection was to identify surfaces and building components which

may be coated with lead-based paint. An EPA certified lead inspector/risk assessor used an X-ray Fluorescence (XRF) analyzer to test building components in accordance with the New York State Education Department requirements and the US Housing and Urban Development Agency Guidelines for the Evaluation and Control of Lead-based Paint in Housing, Chapter 7, Lead-based Paint Inspection, 1997 Revision.

3.2 Lead Sampling Results

Tested components and surfaces include:

- Drywall, Window Casing, Tan, 170 Hallway
- Drywall, Wall C, Tan, 170 Hallway
- Tile, Wall C, Tan, 170 Hallway
- Metal, Window Sash, Grey, 170 Hallway
- Metal, Window Jamb, Grey, 170 Hallway
- Other, Windowsill, Black, 170 Hallway
- Tile, Floor, Tan, 170 Hallway
- Drywall, Door Buck, Grey, Exit E Hallway Basement
- Drywall, Wall C, Tan, Exit E Hallway Basement
- Metal, Door Jamb, Grey, Exit E Hallway Basement
- Metal, Door, Grey, Exit E Hallway Basement
- Tile, Wall C, Tan, Exit E Hallway Basement
- Metal, Door Threshold, Grey, Exit E Hallway Basement
- Metal, Door Frame, Grey, Exit E Hallway Basement
- Tile, Floor, Grey, Exit E Hallway Basement
- Metal, Radiator, Off White, Exit E Hallway Basement
- Metal, Ceiling, Off White, Exit E Hallway Basement
- Metal, Ceiling, Off White, Exit E Hallway Basement
- Metal, Door Frame A, Natural Wood, Exit E Hallway Basement
- Metal, Door Frame A, Green, 015 SGI
- Metal, Door Buck A, Green, 015 SGI
- Wood, Door A, Natural Wood, 015 SGI
- Wood, Window Frame C, Yellow, 015 SGI
- Metal, Window Sash C, Yellow, 015 SGI
- Metal, Window Jamb C, Yellow, 015 SGI
- Other, Windowsill C, Green, 015 SGI
- Drywall, Window Casing C, Tan, 015 SGI
- Metal, HVAC Unit C, Cream, 015 SGI
- Metal, HVAC Unit Vent C, Cream, 015 SGI
- Metal, Ceiling, Cream, 015 SGI
- Metal, HVAC Vent Ceiling, Cream, 015 SGI
- Vinyl, Cove Base C, Dark Blue, 015 SGI

- Tile, Floor, Blue, 015 SGI
- Wood, Coat Hooks D, Green, 015 SGI
- Drywall, Wall A, Cream, 015 SGI
- Drywall, Wall B, Cream, 015 SGI
- Drywall, Wall C, Cream, 015 SGI
- Drywall, Wall D, Cream, 015 SGI
- Wood, Coat Hooks D, Green, 015 SGI
- Drywall, Wall C, Cream, 146 SGI
- Vinyl, Cove Base, Dark Blue, 146 SGI
- Tile, Floor, Off White, 146 SGI
- Metal, HVAC Vent Frame Ceiling, Off White, 146 SGI
- Metal, HVAC Unit, Cream, 146 SGI
- Metal, HVAC Unit Vent, Cream, 146 SGI
- Metal, Ceiling, Cream, 146 SGI
- Drywall, Window Casing C, Yellow, 146 SGI
- Metal, Window Sash C, Yellow, 146 SGI
- Metal, Window Jamb C, Yellow, 146 SGI
- Other, Windowsill C, Green, 146 SGI
- Metal, Entry Door Buck A, Green, Cafeteria
- Metal, Entry Door Frame A, Green, Cafeteria
- Other, Entry Door Threshold A, Green, Cafeteria
- Concrete, Wall A, Cream, Cafeteria
- Concrete, Wall B, Cream, Cafeteria
- Concrete, Wall C, Cream, Cafeteria
- Concrete, Wall D, Cream, Cafeteria
- Concrete, Wall A, Green, Cafeteria
- Concrete, Wall B, Green, Cafeteria
- Concrete, Wall C, Green, Cafeteria
- Concrete, Wall D, Green, Cafeteria
- Metal, Misc, Grey, Cafeteria
- Vinyl, Cove Base, Dark Blue, Cafeteria
- Metal, Exit Door Buck D, Green, Cafeteria
- Metal, Exit Door D, Green, Cafeteria
- Metal, Exit Door Threshold D, Grey, Cafeteria
- Metal, Window Sash D, Blue, Cafeteria
- Metal, Window Jamb D, Blue, Cafeteria
- Concrete, Window Casing D, Cream, Cafeteria
- Laminate, Windowsill D, Green, Cafeteria
- Metal, Round Window Sash C, Blue, Cafeteria
- Metal, Round Window Jamb C, Blue, Cafeteria
- Concrete, Round Window Casing C, Cream, Cafeteria
- Metal, Door Buck B, Green, Cafeteria
- Wood, Door B, Natural Wood, Cafeteria

- Concrete, Support Column, Cream, Cafeteria
- Concrete, Support Column, Green, Cafeteria
- Metal, Ceiling, Off White, Cafeteria
- Metal, HVAC Vent, Off White, Cafeteria
- Wood, Skirt Board B, White, Cafeteria
- Wood, Skirt Board Sink B, White, Cafeteria
- Metal, Door Buck, Green, Kitchen
- Wood, Door, Natural Wood, Kitchen
- Concrete, Wall A, Off White, Kitchen
- Concrete, Wall B, Off White, Kitchen
- Concrete, Wall C, Off White, Kitchen
- Concrete, Wall D, Off White, Kitchen
- Concrete, Wall A, Green, Kitchen
- Concrete, Wall B, Green, Kitchen
- Concrete, Wall C, Green, Kitchen
- Concrete, Wall D, Green, Kitchen
- Drywall, Wall C, Off White, Kitchen
- Metal, Electric Panel, Grey, Kitchen
- Metal, Electric Panel, Grey, Kitchen
- Wood, Chair Rail, Green, Kitchen
- Metal, Door Buck, Green, Kitchen
- Metal, Door, Green, Kitchen
- Metal, Door Frame, Green, Kitchen
- Metal, Door Buck, Green, Kitchen
- Metal, Door, Green, Kitchen
- Metal, Window Frame, Green, Kitchen
- Metal, Ceiling, Off White, Kitchen
- Metal, HVAC Ceiling Vent, Off White, Kitchen

Lead amounts greater than or equal to 1.0 mg/cm^2 have been identified in the components listed below:

- None

All other surfaces and components tested for lead-based paint were below 1.0 mg/cm^2. All workers involved in construction and demolition activities are covered under The OSHA Lead Exposure in Construction Rule (29 CFR 1926.62). OSHA requires Lead in Construction training for personnel that handle materials containing lead in any amount. This standard requires workers to be trained and protected from lead exposure by use of engineering controls, respiratory protection, protective clothing and medical surveillance when airborne concentration of lead exceed established personal exposure limit (PEL) levels.

Complete Lead XRF Results are located in Appendix D.

Please reference Enviroscience Consultants, LLC certifications in Appendix G.

4.0 POLYCHLORINATED BYPHENYLS (PCB) INSPECTION

4.1 PCB Survey Procedures

Enviroscience Consultants, LLC conducted a PCB Inspection to identify PCBs in suspect building materials. Polychlorinated biphenyls (PCBs) are regulated pursuant to the United States Environmental Protection Agency Code of Federal Regulations (40 CFR Part 761) and the Toxic Substances Control Act (TSCA – 15 U.S.C. 2605). These regulations require certain testing and reporting requirements to determine management, recycling and disposal options for PCBs. Although no longer commercially produced in the United States, PCBs may be present in products and materials produced before the 1979 PCB ban. Products that may contain PCBs include: Transformers and capacitors, oil used in motors and hydraulic systems, fluorescent light ballasts, adhesives and tapes, caulking, plastics, etc.

4.2 PCB Sampling Procedures

Collection of bulk samples for PCB analysis is similar to the collection of suspect asbestos containing materials samples;

- Samples were collected in unoccupied areas.
- Surfaces of the material to be sampled were wetted with water mist prior to collection.
- Samples were collected with a cork borer, knife, or other approved sampling tool.
- Sampling tools were decontaminated between each sample.
- Individual sealable containers were used to contain each of the collected samples.
- Samples were double-bagged for transportation to the laboratory.
- Sample containers were labeled with a date and unique sample ID number using a permanent marker.

At the completion of sampling activities, PCB samples are relinquished to New York Environmental Laboratory for analysis. New York Environmental is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program accredited environmental testing laboratory (ELAP #11510).

Reference the Polychlorinated Biphenyls (PCBs) Sample Results in Appendix E.

Appendix A

Asbestos Bulk Sample Results

ENVIROSCIENCE CONSULTANTS
A Mainline Company

2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	11/3/2023
		DATE RECEIVED:	11/6/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 2 - CV Starr
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	1 of 8	CUSTODY #:	36701

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
104101	01-01	Fritz Tile	White w/Gray	Corridor @ Exit E	None Detected		2.0% cellulose	98.0% cement
104102	01-02	Fritz Tile	White w/Gray	Corridor @ Exit E	None Detected		2.0% cellulose	98.0% cement
104103	02-03	Adhesive to White w/Gray Fritz Tile	Brown	Corridor @ Exit E	None Detected by TEM		None Detected	72.5% organics and carbonates 27.5% silicates and opaques
104104	02-04	Adhesive to White w/Gray Fritz Tile	Brown	Corridor @ Exit E	None Detected by TEM		None Detected	76.6% organics and carbonates 23.4% silicates and opaques
104105	03-05	Ceramic Wall Tile Mortar	White/Gray	Corridor @ Exit E	None Detected		3.0% cellulose	97.0% cement
104106	03-06	Ceramic Wall Tile Mortar	White/Gray	Corridor 170	None Detected		3.0% cellulose	97.0% cement
104107	04-07	Exterior Window/Door Frame Caulk	White/Gray	Exit E Doors	None Detected by TEM		None Detected	96.6% organics and carbonates 3.4% silicates and opaques
104108	04-08	Exterior Window/Door Frame Caulk	White/Gray	Corridor 170 Window	None Detected by TEM		None Detected	96.9% organics and carbonates 3.1% silicates and opaques

Method: EPA 600/M4-82/20, 600/R-93/116; NYS DOH ELAP Item 198.1, 198.4, 198.6, 198.8.
ACM: Asbestos Containing Materials contain more than 1%.
None Detected - No asbestos found in samples using polarized light microscopy (PLM). Trace - Asbestos found is 1% or less; not considered ACM.
None Detected by TEM - No asbestos found in samples using transmission electron microscopy (TEM) and polarized light microscopy (PLM) was found to be negative.
Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
Inconclusive - No asbestos found in non-friable organically bound samples using polarized light microscopy (PLM).
Method ELAP 198.6 does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite. Samples of Surface Material that contain Vermiculite are analyzed by ELAP 198.8 for conclusive result.

ANALYZED BY: John A Spillane PLM DATE: 11/9/2023

ANALYZED BY: Edward A Schuster TEM DATE: 11/10/2023

DIRECTOR: Edward A Schuster DATE: 11/10/2023

REVISION #: 0 REVISION DATE: 11/10/2023

ENVIROSCIENCE CONSULTANTS
A Mainline Company

2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	11/3/2023
		DATE RECEIVED:	11/6/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 2 - CV Starr
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	2 of 8	CUSTODY #:	36701

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
104109	05-09	Roof Membrane	Gray	Exit E Overhang	None Detected by TEM		None Detected	95.9% organics and carbonates 4.1% silicates and opaques
104110	05-10	Roof Membrane	Gray	Exit E Overhang	None Detected by TEM		None Detected	96.1% organics and carbonates 3.9% silicates and opaques
104111	06-11	Perlite Insulation	Cream	Exit E Overhang	None Detected		85.0% cellulose	15.0% binders
104112	06-12	Perlite Insulation	Cream	Exit E Overhang	None Detected		85.0% cellulose	15.0% binders
104113	07-13	Exterior Brick Mortar	Brown	Exterior @ Exit E	None Detected		3.0% cellulose	97.0% cement
104114	07-14	Exterior Brick Mortar	Brown	Exterior @ Exit E	None Detected		3.0% cellulose	97.0% cement
104115	08-15	Expansion Joint Caulk	Pink	Exterior @ Exit E	None Detected by TEM		None Detected	71.6% organics and carbonates 28.4% silicates and opaques
104116	08-16	Expansion Joint Caulk	Pink	Exterior @ Exit E	None Detected by TEM		None Detected	56.4% organics and carbonates 43.6% silicates and opaques

Method: EPA 600/M4-82/20, 600/R-93/116; NYS DOH ELAP Item 198.1, 198.4, 198.6, 198.8.
ACM: Asbestos Containing Materials contain more than 1%.
None Detected - No asbestos found in samples using polarized light microscopy (PLM). Trace - Asbestos found is 1% or less; not considered ACM.
None Detected by TEM - No asbestos found in samples using transmission electron microscopy (TEM) and polarized light microscopy (PLM) was found to be negative.
Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
Inconclusive - No asbestos found in non-friable organically bound samples using polarized light microscopy (PLM).
Method ELAP 198.6 does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite. Samples of Surface Material that contain Vermiculite are analyzed by ELAP 198.8 for conclusive result.

ANALYZED BY: _____ PLM DATE: 11/9/2023

ANALYZED BY: _____ TEM DATE: 11/10/2023

DIRECTOR: _____ DATE: 11/10/2023

REVISION #: 0 REVISION DATE: 11/10/2023

ENVIROSCIENCE CONSULTANTS
A Mainline Company

2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	11/3/2023
		DATE RECEIVED:	11/6/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 2 - CV Starr
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	3 of 8	CUSTODY #:	36701

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
104117	09-17	Gypsum Board	White	Corridor 170	None Detected		15.0% cellulose 5.0% fiberglass	80.0% plaster
104118	09-18	Gypsum Board	White	Corridor @ Exit E	None Detected		15.0% cellulose 5.0% fiberglass	80.0% plaster
104119	10-19	Joint Compound	White	Corridor @ Exit E	None Detected		None Detected	91.2% organics and carbonates 8.8% silicates and opaques
104120	10-20	Joint Compound	White	Corridor @ Exit E	None Detected		None Detected	91.6% organics and carbonates 8.4% silicates and opaques
104121	11-21	Gypsum Board	White	Room 146	None Detected		15.0% cellulose 5.0% fiberglass	80.0% plaster
104122	11-22	Gypsum Board	White	Room 015	None Detected		15.0% cellulose 5.0% fiberglass	80.0% plaster

Method: EPA 600/M4-82/20, 600/R-93/116; NYS DOH ELAP Item 198.1, 198.4, 198.6, 198.8.
ACM: Asbestos Containing Materials contain more than 1%.
None Detected - No asbestos found in samples using polarized light microscopy (PLM). Trace - Asbestos found is 1% or less; not considered ACM.
None Detected by TEM - No asbestos found in samples using transmission electron microscopy (TEM) and polarized light microscopy (PLM) was found to be negative.
Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
Inconclusive - No asbestos found in non-friable organically bound samples using polarized light microscopy (PLM).
Method ELAP 198.6 does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite. Samples of Surface Material that contain Vermiculite are analyzed by ELAP 198.8 for conclusive result.

ANALYZED BY: John A Spillane PLM DATE: 11/9/2023

ANALYZED BY: Edward A Schuster TEM DATE: 11/10/2023

DIRECTOR: Edward A Schuster DATE: 11/10/2023

REVISION #: 0 REVISION DATE: 11/10/2023

ENVIROSCIENCE CONSULTANTS
A Mainline Company

2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	11/3/2023
		DATE RECEIVED:	11/6/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 2 - CV Starr
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	4 of 8	CUSTODY #:	36701

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
104123	12-23	Joint Compound	White	Room 146	None Detected		None Detected	83.2% organics and carbonates 16.8% silicates and opaques
104124	12-24	Joint Compound	White	Room 015	None Detected		None Detected	52.4% organics and carbonates 47.6% silicates and opaques
104125	13-25	12"x12" Floor Tile	Yellow	Room 015	None Detected by TEM		None Detected	95.5% organics and carbonates 5.0% silicates and opaques
104126	13-26	12"x12" Floor Tile	Yellow	Room 015	None Detected by TEM		None Detected	94.8% organics and carbonates 5.2% silicates and opaques
104127	14-27	12"x12" Floor Tile	Blue	Room 015	None Detected by TEM		None Detected	96.8% organics and carbonates 3.2% silicates and opaques
104128	14-28	12"x12" Floor Tile	Blue	Cafeteria	None Detected by TEM		None Detected	96.4% organics and carbonates 3.6% silicates and opaques

Method: EPA 600/M4-82/20, 600/R-93/116; NYS DOH ELAP Item 198.1, 198.4, 198.6, 198.8.
ACM: Asbestos Containing Materials contain more than 1%.
None Detected - No asbestos found in samples using polarized light microscopy (PLM). Trace - Asbestos found is 1% or less; not considered ACM.
None Detected by TEM - No asbestos found in samples using transmission electron microscopy (TEM) and polarized light microscopy (PLM) was found to be negative.
Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
Inconclusive - No asbestos found in non-friable organically bound samples using polarized light microscopy (PLM).
Method ELAP 198.6 does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite. Samples of Surface Material that contain Vermiculite are analyzed by ELAP 198.8 for conclusive result.

ANALYZED BY: John A Spillane PLM DATE: 11/9/2023

ANALYZED BY: Edward A Schuster TEM DATE: 11/10/2023

DIRECTOR: Edward A Schuster DATE: 11/10/2023

REVISION #: 0 REVISION DATE: 11/10/2023

ENVIROSCIENCE CONSULTANTS
A Mainline Company

2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	11/3/2023
		DATE RECEIVED:	11/6/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 2 - CV Starr
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	5 of 8	CUSTODY #:	36701

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
104129	15-29	12"x12" Floor Tile	White	Room 015	None Detected by TEM		None Detected	92.2% organics and carbonates 7.8% silicates and opaques
104130	15-30	12"x12" Floor Tile	White	Cafeteria	None Detected by TEM		None Detected	95.1% organics and carbonates 4.9% silicates and opaques
104131	16-31	Mastic to 12"x12" Yellow, Blue & White Floor Tiles	Black	Room 015	None Detected by TEM		None Detected	74.8% organics and carbonates 25.2% silicates and opaques
104132	16-32	Mastic to 12"x12" Yellow, Blue & White Floor Tiles	Black	Cafeteria	None Detected by TEM		None Detected	72.2% organics and carbonates 27.8% silicates and opaques
104133	17-33	Exterior Window/Expansion Joint Caulk	Gray	Exterior, Room 146	None Detected by TEM		None Detected	90.2% organics and carbonates 9.8% silicates and opaques
104134	17-34	Exterior Window/Expansion Joint Caulk	Gray	Exterior, Room 015	None Detected by TEM		None Detected	91.2% organics and carbonates 8.8% silicates and opaques
104135	18-35	Exterior Brick Mortar	Brown	Exterior, Room 146	None Detected		3.0% cellulose	97.0% cement

Method: EPA 600/M4-82/20, 600/R-93/116; NYS DOH ELAP Item 198.1, 198.4, 198.6, 198.8.
ACM: Asbestos Containing Materials contain more than 1%.
None Detected - No asbestos found in samples using polarized light microscopy (PLM). Trace - Asbestos found is 1% or less; not considered ACM.
None Detected by TEM - No asbestos found in samples using transmission electron microscopy (TEM) and polarized light microscopy (PLM) was found to be negative.
Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
Inconclusive - No asbestos found in non-friable organically bound samples using polarized light microscopy (PLM).
Method ELAP 198.6 does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite. Samples of Surface Material that contain Vermiculite are analyzed by ELAP 198.8 for conclusive result.

ANALYZED BY: John A Spillane PLM DATE: 11/9/2023 ANALYZED BY: Edward A Schuster TEM DATE: 11/10/2023

DIRECTOR: Edward A Schuster DATE: 11/10/2023 REVISION #: 0 REVISION DATE: 11/10/2023

ENVIROSCIENCE CONSULTANTS
A Mainline Company

2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	11/3/2023
		DATE RECEIVED:	11/6/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 2 - CV Starr
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	6 of 8	CUSTODY #:	36701

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
104136	18-36	Exterior Brick Mortar	Brown	Exterior, Room 015	None Detected		3.0% cellulose	97.0% cement
104137	19-37	Cove Base	Blue	Room 015	None Detected by TEM		None Detected	78.7% organics and carbonates 21.3% silicates and opaques
104138	19-38	Cove Base	Blue	Cafeteria	None Detected by TEM		None Detected	79.9% organics and carbonates 20.1% silicates and opaques
104139	20-39	Mastic to Blue Cove Base	Cream	Room 015	None Detected by TEM		None Detected	84.0% organics and carbonates 16.0% silicates and opaques
104140	20-40	Mastic to Blue Cove Base	Cream	Cafeteria	None Detected by TEM		None Detected	87.4% organics and carbonates 12.6% silicates and opaques
104141	21-41	Exterior Window/Expansion Joint Caulk	White/Gray	Exterior, Cafeteria	None Detected by TEM		None Detected	91.6% organics and carbonates 8.4% silicates and opaques
104142	21-42	Exterior Window/Expansion Joint Caulk	White/Gray	Exterior, Cafeteria	None Detected by TEM		None Detected	92.2% organics and carbonates 7.8% silicates and opaques

Method: EPA 600/M4-82/20, 600/R-93/116; NYS DOH ELAP Item 198.1, 198.4, 198.6, 198.8.
ACM: Asbestos Containing Materials contain more than 1%.
None Detected - No asbestos found in samples using polarized light microscopy (PLM). Trace - Asbestos found is 1% or less; not considered ACM.
None Detected by TEM - No asbestos found in samples using transmission electron microscopy (TEM) and polarized light microscopy (PLM) was found to be negative.
Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
Inconclusive - No asbestos found in non-friable organically bound samples using polarized light microscopy (PLM).
Method ELAP 198.6 does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite. Samples of Surface Material that contain Vermiculite are analyzed by ELAP 198.8 for conclusive result.

ANALYZED BY: _____ PLM DATE: 11/9/2023

ANALYZED BY: _____ TEM DATE: 11/10/2023

DIRECTOR: _____ DATE: 11/10/2023

REVISION #: 0 REVISION DATE: 11/10/2023

ENVIROSCIENCE CONSULTANTS
A Mainline Company

2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	11/3/2023
		DATE RECEIVED:	11/6/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 2 - CV Starr
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	7 of 8	CUSTODY #:	36701

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
104143	22-43	Ceramic Floor Tile Mortar	Gray	Cafeteria Kitchen	None Detected		3.0% cellulose	97.0% cement
104144	22-44	Ceramic Floor Tile Mortar	Gray	Cafeteria Kitchen	None Detected		3.0% cellulose	97.0% cement
104145	23-45	Ceramic Floor Tile Backing	Brown	Cafeteria Kitchen	None Detected		3.0% cellulose	97.0% cement
104146	23-46	Ceramic Floor Tile Backing	Brown	Cafeteria Kitchen	None Detected		3.0% cellulose	97.0% cement
104147	24-47	Spray-on Fire Proofing	Gray	Room 015	None Detected		70.0% cellulose	30.0% binders
104148	24-48	Spray-on Fire Proofing	Gray	Room 015	None Detected		70.0% cellulose	30.0% binders
104149	24-49	Spray-on Fire Proofing	Gray	Room 015	None Detected		70.0% cellulose	30.0% binders
104150	24-50	Spray-on Fire Proofing	Gray	Cafeteria	None Detected		70.0% cellulose	30.0% binders
104151	24-51	Spray-on Fire Proofing	Gray	Cafeteria	None Detected		70.0% cellulose	30.0% binders
104152	24-52	Spray-on Fire Proofing	Gray	Cafeteria	None Detected		70.0% cellulose	30.0% binders

Method: EPA 600/M4-82/20, 600/R-93/116; NYS DOH ELAP Item 198.1, 198.4, 198.6, 198.8.
ACM: Asbestos Containing Materials contain more than 1%.
None Detected - No asbestos found in samples using polarized light microscopy (PLM). Trace - Asbestos found is 1% or less; not considered ACM.
None Detected by TEM - No asbestos found in samples using transmission electron microscopy (TEM) and polarized light microscopy (PLM) was found to be negative.
Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
Inconclusive - No asbestos found in non-friable organically bound samples using polarized light microscopy (PLM).
Method ELAP 198.6 does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite. Samples of Surface Material that contain Vermiculite are analyzed by ELAP 198.8 for conclusive result.

ANALYZED BY: John A Spillane PLM DATE: 11/9/2023 ANALYZED BY: Edward A Schuster TEM DATE: 11/10/2023

DIRECTOR: Edward A Schuster DATE: 11/10/2023 REVISION #: 0 REVISION DATE: 11/10/2023

ENVIROSCIENCE CONSULTANTS
A Mainline Company

2150 Smithtown Ave., Suite 3, Ronkonkoma, NY 11779
T: 631.580.3191 • F: 631.580.3195 • W: envirohealth.org

ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	11/3/2023
		DATE RECEIVED:	11/6/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 2 - CV Starr
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	8 of 8	CUSTODY #:	36701

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
104153	24-53	Spray-on Fire Proofing	Gray	Cafeteria	None Detected		70.0% cellulose	30.0% binders

Method: EPA 600/M4-82/20, 600/R-93/116; NYS DOH ELAP Item 198.1, 198.4, 198.6, 198.8.
ACM: Asbestos Containing Materials contain more than 1%.
None Detected - No asbestos found in samples using polarized light microscopy (PLM). Trace - Asbestos found is 1% or less; not considered ACM.
None Detected by TEM - No asbestos found in samples using transmission electron microscopy (TEM) and polarized light microscopy (PLM) was found to be negative.
Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
Inconclusive - No asbestos found in non-friable organically bound samples using polarized light microscopy (PLM).
Method ELAP 198.6 does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite. Samples of Surface Material that contain Vermiculite are analyzed by ELAP 198.8 for conclusive result.

ANALYZED BY: John A Spillane PLM DATE: 11/9/2023

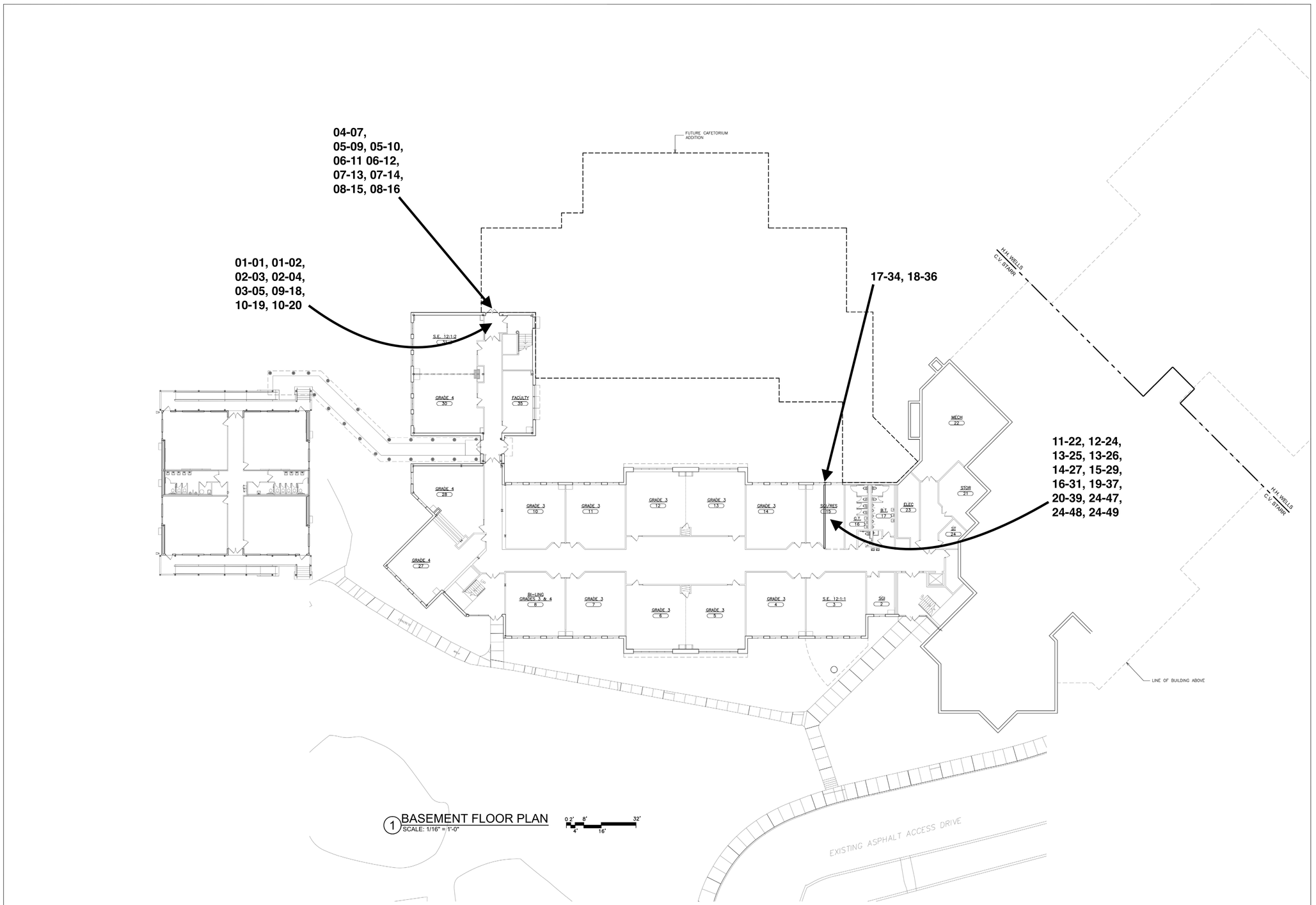
ANALYZED BY: Edward A Schuster TEM DATE: 11/10/2023

DIRECTOR: Edward A Schuster DATE: 11/10/2023

REVISION #: 0 REVISION DATE: 11/10/2023

Appendix B

Asbestos Bulk Sample Location Drawings



1 BASEMENT FLOOR PLAN
SCALE: 1/16" = 1'-0"

0 2' 4' 8' 16' 32'

FULLER D'ANGELO P.C. ARCHITECTS PLANNERS
48 KNOLLWOOD ROAD ELMSFORD NEW YORK 10523
TEL. 914.592.4444 FAX 914.592.1717
WWW.FULLERDANGELO.COM

LICENSE EXP. DATE: 03-31-2025

S.E.D. CONTROL NUMBER:
48-06-01-06-0-001-026

PROJECT TITLE:
BREWSTER CENTRAL SCHOOL DISTRICT
C.V. STARR INTERMEDIATE SCHOOL
CAFETORIUM ADDITION & INTERIOR RENOVATIONS AS A CAFETERIA
20 FARM TO MARKET ROAD BREWSTER, NY 10509

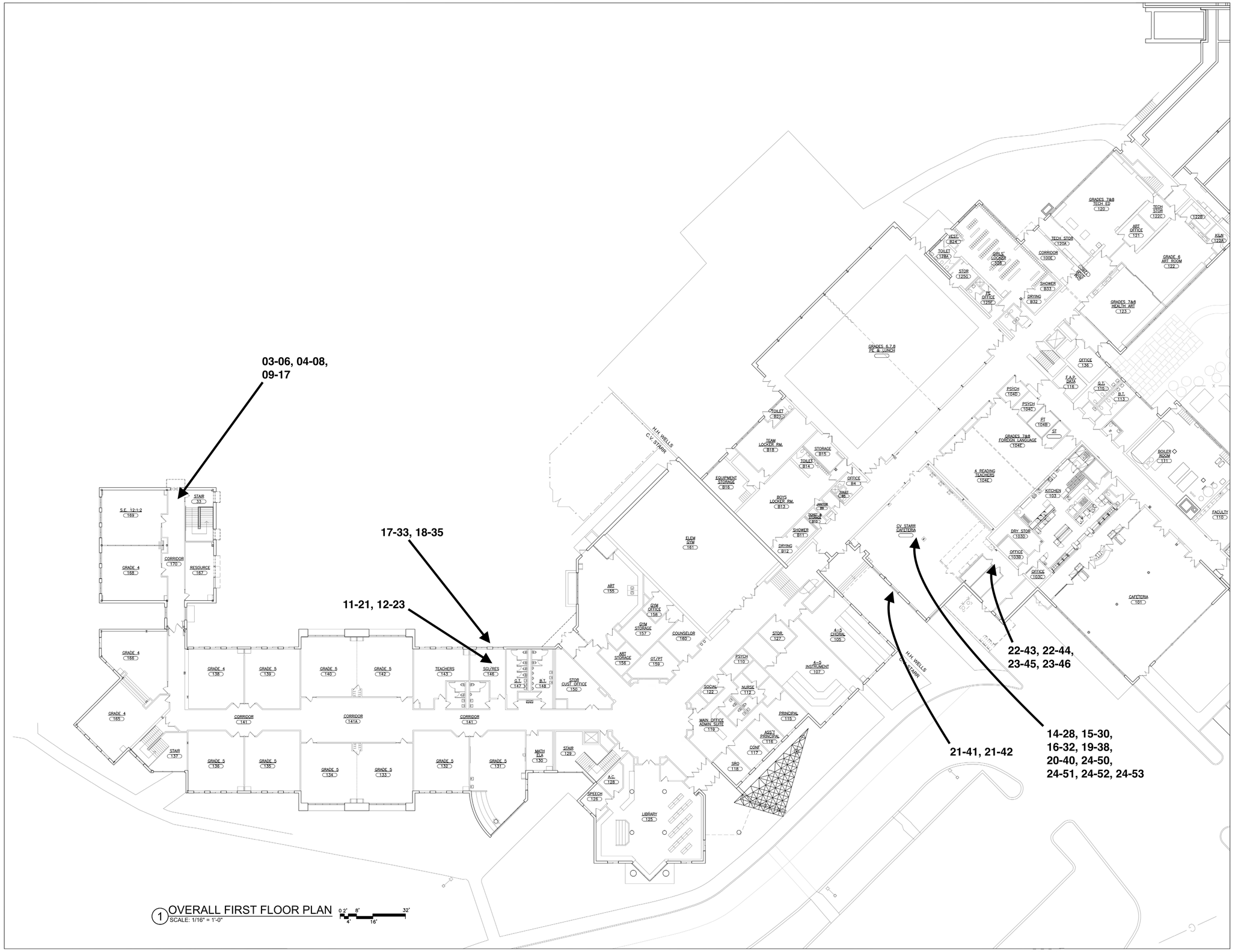
DRAWING TITLE

DATE	ISSUED TO
08-31-2023	S.D. SUBMISSION

SHEET SIZE: 30"x42"
SCALE: AS NOTED
DRAWN BY: DC
DRAWING NO.: BSL001
FILE NO.: 23505.02

PLOT DATE: November 02, 2023 - 12:55pm

FILE: I:\23505.02 CVS Cafetorium & Existing Cafeteria Conversion\DRAWINGS\CURRENT\1-F&D\REF\X-23505.02-TTLBLK 30x42.dwg



FULLER D'ANGELO P.C. ARCHITECTS PLANNERS
48 KNOLLWOOD ROAD ELMSFORD NEW YORK 10523
TEL. 914.592.2444 FAX 914.592.1717
WWW.FULLERANDANGELO.COM

LICENSE EXP. DATE: 03-31-2025

S.E.D. CONTROL NUMBER:
48-06-01-06-0-001-026

PROJECT TITLE
BREWSTER CENTRAL SCHOOL DISTRICT
C.V. STARR INTERMEDIATE SCHOOL
CAFETORIUM ADDITION / INTERIOR
RENOVATIONS & EXISTING CAFETERIA
20 FARM TO MARKET ROAD BREWSTER, NY 10509

DRAWING TITLE

DATE	ISSUED TO
08-31-2023	S.D. SUBMISSION

SHEET SIZE: 30"x42"	DRAWING NO.: BSL002
SCALE: AS NOTED	
DRAWN BY: DC	FILE NO.: 23505.02

PLOT DATE: November 02, 2023 - 12:55pm

FILE: I:\23505.02 CVS Cafetorium & Existing Cafeteria Conversion\DRAWINGS\CURRENT\1-F&D\REF\X-23505.02-TTLBLK 30x42.dwg

Appendix C

Asbestos Containing Materials Location Drawings
(NOT APPLICABLE)

Appendix D

Lead XRF Results

ENVIROSCIENCE CONSULTANTS
A Mainline Company

Lead XRF Inspection Report

Client: Brewster Central School District	Date: August 17, 2023
Project: Brewster CSD District Wide Hazardous Material Inspections (Package 2 - C.V. Starr)	Job #: 24040
Inspector Name: Wade Coble	Signature: *Wade Coble* XRF Serial Number: 2819

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
19772	-	-	-	Calibration Check	1.3	-
19773	-	-	-	Calibration Check	1.1	-
19774	-	-	-	Calibration Check	1.1	-
19775	-	-	-	Calibration Check	-0.1	-
19776	-	-	-	Calibration Check	0.0	-
19777	-	-	-	Calibration Check	-0.1	-
19778	Drywall	Window Casing	Tan	170 Hallway	0.2	Negative
19779	Drywall	Wall C	Tan	170 Hallway	0.0	Negative
19780	Tile	Wall C	Tan	170 Hallway	0.1	Negative
19781	Metal	Window Sash	Grey	170 Hallway	0.3	Negative
19782	Metal	Window Jamb	Grey	170 Hallway	0.2	Negative
19783	Other	Window Sill	Black	170 Hallway	0.2	Negative
19784	Tile	Floor	Tan	170 Hallway	0.2	Negative
19785	Drywall	Door Buck	Grey	Exit E Hallway Basement	0.1	Negative
19786	Drywall	Wall C	Tan	Exit E Hallway Basement	0.0	Negative

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
19787	Metal	Door Jamb	Grey	Exit E Hallway Basement	0.1	Negative
19788	Metal	Door	Grey	Exit E Hallway Basement	0.1	Negative
19789	Tile	Wall C	Tan	Exit E Hallway Basement	-0.1	Negative
19790	Metal	Door Threshold	Grey	Exit E Hallway Basement	0.3	Negative
19791	Metal	Door Frame	Grey	Exit E Hallway Basement	0.0	Negative
19792	Tile	Floor	Grey	Exit E Hallway Basement	0.2	Negative
19793	Metal	Radiator	Off White	Exit E Hallway Basement	0.1	Negative
19794	Metal	Ceiling	Off White	Exit E Hallway Basement	0.1	Negative
19795	Metal	Ceiling	Off White	Exit E Hallway Basement	0.2	Negative
19796	Metal	Door Frame A	Natural Wood	Exit E Hallway Basement	0.0	Negative
19797	Metal	Door Frame A	Green	015 SGI	0.1	Negative
19798	Metal	Door Buck A	Green	015 SGI	0.4	Negative
19799	Wood	Door A	Natural Wood	015 SGI	0.0	Negative
19800	Wood	Window Frame C	Yellow	015 SGI	0.2	Negative
19801	Metal	Window Sash C	Yellow	015 SGI	0.2	Negative
19802	Metal	Window Jamb C	Yellow	015 SGI	0.2	Negative
19803	Other	Window Sill C	Green	015 SGI	0.0	Negative
19804	Drywall	Window Casing C	Tan	015 SGI	0.1	Negative
19805	Metal	HVAC Unit C	Cream	015 SGI	0.1	Negative
19806	Metal	HVAC Unit Vent C	Cream	015 SGI	-0.1	Negative
19807	Metal	Ceiling	Cream	015 SGI	0.1	Negative

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
19808	Metal	HVAC Vent Ceiling	Cream	015 SGI	0.2	Negative
19809	Vinyl	Cove Base C	Dark Blue	015 SGI	0.2	Negative
19810	Tile	Floor	Blue	015 SGI	0.2	Negative
19811	Wood	Coat Hooks D	Green	015 SGI	0.1	Negative
19812	Drywall	Wall A	Cream	015 SGI	0.2	Negative
19813	Drywall	Wall B	Cream	015 SGI	0.1	Negative
19814	Drywall	Wall C	Cream	015 SGI	0.1	Negative
19815	Drywall	Wall D	Cream	015 SGI	0.2	Negative
19816	Wood	Coat Hooks D	Green	015 SGI	0.0	Negative
19817	Drywall	Wall C	Cream	146 SGI	0.2	Negative
19818	Vinyl	Cove Base	Dark Blue	146 SGI	0.1	Negative
19819	Tile	Floor	Off White	146 SGI	0.3	Negative
19820	Metal	HVAC Vent Frame Ceiling	Off White	146 SGI	0.0	Negative
19821	Metal	HVAC Unit	Cream	146 SGI	0.0	Negative
19822	Metal	HVAC Unit Vent	Cream	146 SGI	0.0	Negative
19823	Metal	Ceiling	Cream	146 SGI	0.0	Negative
19824	Drywall	Window Casing C	Yellow	146 SGI	0.1	Negative
19825	Metal	Window Sash C	Yellow	146 SGI	0.0	Negative
19826	Metal	Window Jamb C	Yellow	146 SGI	-0.3	Negative
19827	Other	Window Sill C	Green	146 SGI	0.1	Negative
19828	Metal	Entry Door Buck A	Green	Cafeteria	0.1	Negative

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
19829	Metal	Entry Door Frame A	Green	Cafeteria	0.1	Negative
19830	Other	Entry Door Threshold A	Green	Cafeteria	0.6	Negative
19831	Concrete	Wall A	Cream	Cafeteria	0.3	Negative
19832	Concrete	Wall B	Cream	Cafeteria	-0.1	Negative
19833	Concrete	Wall C	Cream	Cafeteria	-0.2	Negative
19834	Concrete	Wall D	Cream	Cafeteria	0.0	Negative
19835	Concrete	Wall A	Green	Cafeteria	-0.1	Negative
19836	Concrete	Wall B	Green	Cafeteria	-0.2	Negative
19837	Concrete	Wall C	Green	Cafeteria	0.0	Negative
19838	Concrete	Wall D	Green	Cafeteria	0.2	Negative
19839	Metal	Misc	Grey	Cafeteria	0.0	Negative
19840	Vinyl	Cove Base	Dark Blue	Cafeteria	-0.1	Negative
19841	Metal	Exit Door Buck D	Green	Cafeteria	0.6	Negative
19842	Metal	Exit Door D	Green	Cafeteria	0.2	Negative
19843	Metal	Exit Door Threshold D	Grey	Cafeteria	0.2	Negative
19844	Metal	Window Sash D	Blue	Cafeteria	0.4	Negative
19845	Metal	Window Jamb D	Blue	Cafeteria	0.3	Negative
19846	Concrete	Window Casing D	Cream	Cafeteria	-0.3	Negative
19847	Laminate	Window Sill D	Green	Cafeteria	0.0	Negative
19848	Metal	Round Window Sash C	Blue	Cafeteria	0.3	Negative
19849	Metal	Round Window Jamb C	Blue	Cafeteria	0.3	Negative

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
19850	Concrete	Round Window Casing C	Cream	Cafeteria	0.2	Negative
19851	Metal	Door Buck B	Green	Cafeteria	0.3	Negative
19852	Wood	Door B	Natural Wood	Cafeteria	0.0	Negative
19853	Concrete	Support Column	Cream	Cafeteria	0.4	Negative
19854	Concrete	Support Column	Green	Cafeteria	0.2	Negative
19855	Metal	Ceiling	Off White	Cafeteria	0.1	Negative
19856	Metal	HVAC Vent	Off White	Cafeteria	0.2	Negative
19857	Wood	Skirt Board B	White	Cafeteria	0.1	Negative
19858	Wood	Skirt Board Sink B	White	Cafeteria	0.0	Negative
19859	Metal	Door Buck	Green	Kitchen	0.6	Negative
19860	Wood	Door	Natural Wood	Kitchen	0.0	Negative
19861	Concrete	Wall A	Off White	Kitchen	0.1	Negative
19862	Concrete	Wall B	Off White	Kitchen	0.0	Negative
19863	Concrete	Wall C	Off White	Kitchen	0.1	Negative
19864	Concrete	Wall D	Off White	Kitchen	0.0	Negative
19865	Concrete	Wall A	Green	Kitchen	0.1	Negative
19866	Concrete	Wall B	Green	Kitchen	-0.1	Negative
19867	Concrete	Wall C	Green	Kitchen	-0.1	Negative
19868	Concrete	Wall D	Green	Kitchen	-0.1	Negative
19869	Drywall	Wall C	Off White	Kitchen	0.3	Negative
19870	Metal	Electric Panel	Grey	Kitchen	0.2	Negative

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
19871	Metal	Electric Panel	Grey	Kitchen	0.2	Negative
19872	Wood	Chair Rail	Green	Kitchen	-0.1	Negative
19873	Metal	Door Buck	Green	Kitchen	0.6	Negative
19874	Metal	Door	Green	Kitchen	0.1	Negative
19875	Metal	Door Frame	Green	Kitchen	0.7	Negative
19876	Metal	Door Buck	Green	Kitchen	0.1	Negative
19877	Metal	Door	Green	Kitchen	0.0	Negative
19878	Metal	Window Frame	Green	Kitchen	0.7	Negative
19879	Metal	Ceiling	Off White	Kitchen	0.2	Negative
19880	Metal	HVAC Ceiling Vent	Off White	Kitchen	0.2	Negative
19891	-	-	-	Calibration Check	1.1	
19892	-	-	-	Calibration Check	1.1	
19893	-	-	-	Calibration Check	1.1	
19894	-	-	-	Calibration Check	-0.2	
19895	-	-	-	Calibration Check	0.0	
19896	-	-	-	Calibration Check	-0.2	

Appendix E

Polychlorinated Biphenyls (PCBs) Sample Results

NEW YORK ENVIRONMENTAL

88 Harbor Road
Port Washington, NY 11050
(516) 944-9500

Laboratory Report for PCBs in Solid Waste

Report No.: 236303-27424

Customer: Enviroscience Consultants, Inc.
2150 Smithtown Avenue
Ronkonkoma, NY 11779

Project: Brewster CSD; CV Starr IS, 20 Farm To Market Rd Brewster, NY

Lab Sample ID: 231107P005 **Collected:** 11/3/2023
Client ID: 1 **Received:** 11/7/2023
Description: Exit E Doors, Exterior Window/Door Frame Caulk, White/Gray

Parameter	Method	Analysis Date	LOQ	Result	MCL	Units	Flag(s)
PCB 1016	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
PCB 1221	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
PCB 1232	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
PCB 1242	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
PCB 1248	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
PCB 1254	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
PCB 1260	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
PCB 1262	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
PCB 1268	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
Total PCBs	EPA 8082A	11/08/23	0.955	<0.955	50.0	mg/kg	G
Extraction	EPA 3546	11/07/23		Complete			

Lab Sample ID: 231107P006 **Collected:** 11/3/2023
Client ID: 2 **Received:** 11/7/2023
Description: Exterior C Exit E, Expansion Joint Caulk, Pink

Parameter	Method	Analysis Date	LOQ	Result	MCL	Units	Flag(s)
PCB 1016	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
PCB 1221	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
PCB 1232	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
PCB 1242	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
PCB 1248	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
PCB 1254	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
PCB 1260	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
PCB 1262	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
PCB 1268	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
Total PCBs	EPA 8082A	11/08/23	0.516	<0.516	50.0	mg/kg	
Extraction	EPA 3546	11/07/23		Complete			

Approved: _____
Li Tsang, Laboratory Director

NYSDOH ELAP Lab ID 11510

Lab Sample ID:	231107P007	**Collected:**	11/3/2023
Client ID:	3	**Received:**	11/7/2023
Description:	Exterior Room O15, Exterior Window/ Expansion Joint Caulk, Gray		

Parameter	Method	Analysis Date	LOQ	Result	MCL	Units	Flag(s)
PCB 1016	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
PCB 1221	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
PCB 1232	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
PCB 1242	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
PCB 1248	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
PCB 1254	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
PCB 1260	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
PCB 1262	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
PCB 1268	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
Total PCBs	EPA 8082A	11/08/23	0.726	<0.726	50.0	mg/kg	
Extraction	EPA 3546	11/07/23		Complete			

Lab Sample ID:	231107P008	**Collected:**	11/3/2023
Client ID:	4	**Received:**	11/7/2023
Description:	Exterior Cafeteria, Exterior Window/ Expansion Joint Caulk, White/Gray		

Parameter	Method	Analysis Date	LOQ	Result	MCL	Units	Flag(s)
PCB 1016	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
PCB 1221	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
PCB 1232	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
PCB 1242	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
PCB 1248	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
PCB 1254	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
PCB 1260	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
PCB 1262	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
PCB 1268	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
Total PCBs	EPA 8082A	11/08/23	0.590	<0.590	50.0	mg/kg	
Extraction	EPA 3546	11/07/23		Complete			

Comment(s):

LOQ: Limit of Quantitation PCB: Polychlorinate biphenyl MCL: Maximum Contaminant Limit

Samples analyzed on a wet-weight, "as-received" basis.

G: Surrogate recovery is outside QC limits.

NYSDOH ELAP Lab ID 11510

Approved: _____
Li Tsang, Laboratory Director

NEW YORK ENVIRONMENTAL

88 HARBOR ROAD
PORT WASHINGTON, NY 11050
(516) 944-9500 • FAX (516) 944-9507
www.nyenvironmental.com

76401

Client Brewster CSD	Client Proj. # 24040	Date 11/3/23
Project Fuller D'Angelo P2	Address CV Starr IS, 20 Farm to Market Rd, Brewster, NY	
Technician Drew Choskin	Turnaround 5-Day	Lab Use Only

Sample #	Location and/or Sample Description	Material	PCB ID	Result (mg/kg)	MDL
01	Exit E Doors	Exterior Window/Door Frame Caulk (White/Gray)	ND	<0.955	0.955
02	Exterior @ Exit E	Expansion Joint Caulk, Pink	ND	<0.516	0.516
03	Exterior, Room 015	Exterior Window/Expansion Joint Caulk, Gray	ND	<0.726	0.726
04	Exterior, Cafeteria	Exterior Window/Expansion Joint Caulk, White/Gray	ND	<0.590	0.590

231107P005-P008

236303

C 2 7 4 2 4

Relinquished: Drew Choskin Signature: _____ Date: 11/6/23 Time: Via FEDEX

Received: Michele Wiedersum Signature: _____ Date: 11/7/23 Time: 1030

Lab Use Only:

NYEA #.	Analyst Initials AL	Analysis Date: 11/08/23

Email Results to: _____@_____

Via Fedex: 7740 0914 3346

Appendix F

Photo Log

Non-asbestos containing Fritz Tile, Adhesive & Ceramic Wall Tile Mortar (Corridor 170 & Exit E)

Non-asbestos containing 12"x12" Floor Tiles & Mastic, various colors (Rooms 015, 146 & Cafeteria)

Non-asbestos containing Spray-on Fireproofing (Rooms 015, 146 & Cafeteria)

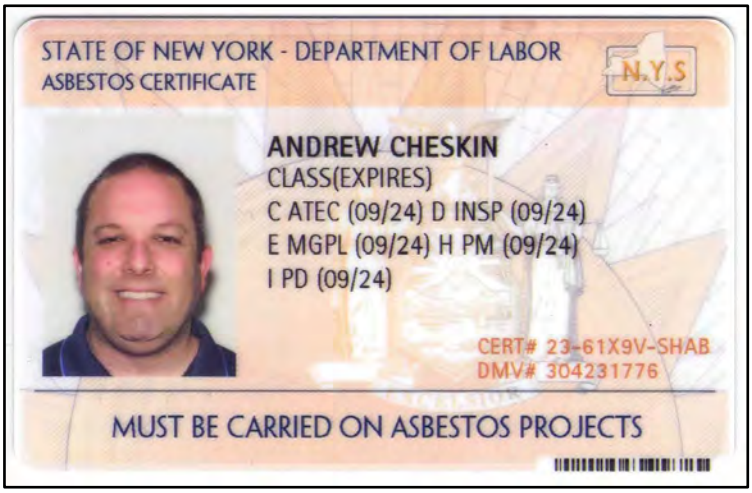
Non-asbestos containing Ceramic Floor Tile Mortar & Backing (Cafeteria Kitchen)

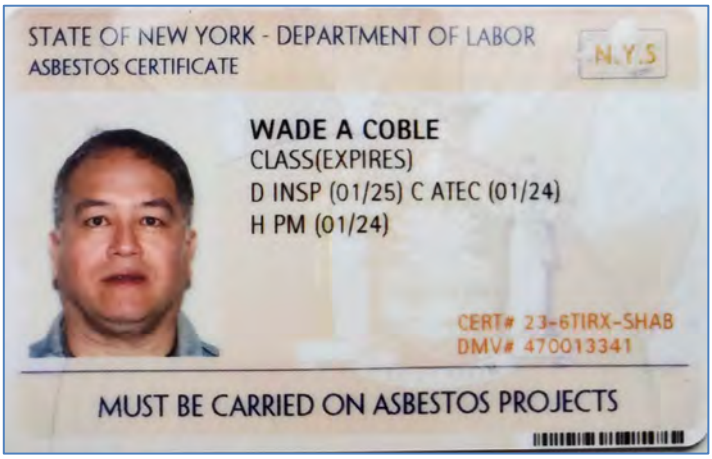
Non-asbestos containing Exterior Window/Door Frame Caulk, Expansion Joint Caulk, Exterior Brick Mortar and Overhang Roofing Materials (Corridor 170 & Exit E)

Non-asbestos containing Exterior Window/Expansion Joint Caulk (Cafeteria)

Appendix G

Certifications


STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE
N.Y.S
ANDREW CHESKIN
CLASS(EXPIRES)
C ATEC (09/24) D INSP (09/24)
E MGPL (09/24) H PM (09/24)
I PD (09/24)
CERT# 23-61X9V-SHAB
DMV# 304231776
MUST BE CARRIED ON ASBESTOS PROJECTS


STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE
N.Y.S
WADE A COBLE
CLASS(EXPIRES)
D INSP (01/25) C ATEC (01/24)
H PM (01/24)
CERT# 23-6TIRX-SHAB
DMV# 470013341
MUST BE CARRIED ON ASBESTOS PROJECTS

ENVIROSCIENCE CONSULTANTS
A Mainline Company

WE ARE YOUR DOL

NEW YORK STATE | Department of Labor

DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

ASBESTOS HANDLING LICENSE

Enviroscience Consultants, LLC
2150 Smithtown Avenue, Suite 3, Ronkonkoma, NY, 11779

License Number: 28733
License Class: RESTRICTED
Date of Issue: 10/20/2023
Expiration Date: 11/30/2024
Duly Authorized Representative: Bartley Gallagher

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Amy Phillips, Director
For the Commissioner of Labor

EXCELSIOR

SH 432 (12/21)

ENVIROSCIENCE CONSULTANTS
A Mainline Company

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. GLENN L. NEUSCHWENDER
ENVIROSCIENCE CONSULTANTS, LLC
2150 SMITHTOWN AVENUE SUITE 3
RONKONKOMA, NY 11779

NY Lab Id No: 11681

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Mate	Item 198.8 of Manual

Serial No.: 67114

ENVIROSCIENCE CONSULTANTS
A Mainline Company

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ilac-MRA

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200531-0

Enviroscience Consultants, LLC
Ronkonkoma, NY

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2023-10-01 through 2024-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program

ENVIROSCIENCE CONSULTANTS
A Mainline Company

National Voluntary Laboratory Accreditation Program

NVLAP® ilac-MRA

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Enviroscience Consultants, LLC
2150 Smithtown Ave.
Suite 3
Ronkonkoma, NY 11779
Mr. Edward Detweiler
Phone: 631-580-3191 Fax: 631-580-3195
Email: edetweiler@envirohealth.org
http://www.envirohealth.org

ASBESTOS FIBER ANALYSIS **NVLAP LAB CODE 200531-0**

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

Effective 2023-10-01 through 2024-09-30

ENVIROSCIENCE CONSULTANTS
A Mainline Company

United States Environmental Protection Agency

This is to certify that

Andrew B Cheskin

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires August 06, 2024

LBP-R-11931-2
Certification #

August 02, 2021
Issued On

Ben Conetta

Ben Conetta, Chief
Chemicals and Multimedia Programs Branch

ENVIROSCIENCE CONSULTANTS
A Mainline Company

United States Environmental Protection Agency

This is to certify that

Wade Coble

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires October 18, 2025

LBP-R-I219351-1
Certification #

October 04, 2022
Issued On

Ben Conetta, Chief
Chemicals and Multimedia Programs Branch

ENVIROSCIENCE CONSULTANTS
A Mainline Company

United States Environmental Protection Agency

This is to certify that

Enviroscience Consultants, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires August 19, 2025

LBP-1327-2
Certification #

August 05, 2022
Issued On

Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

ENVIROSCIENCE CONSULTANTS
A Mainline Company

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. LI TSANG
NY ENVIRONMENTAL AND ANALYTICAL LABS INC
88 HARBOR ROAD
PORT WASHINGTON, NY 11050

NY Lab Id No: 11510

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Metals III	
Thallium, Total	EPA 6010D
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Sample Preparation Methods	
	EPA 3050B
	EPA 3550C

Serial No.: 66419

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

ENVIROSCIENCE CONSULTANTS
A Mainline Company

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. LI TSANG
NY ENVIRONMENTAL AND ANALYTICAL LABS INC
88 HARBOR ROAD
PORT WASHINGTON, NY 11050

NY Lab Id No: 11510

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous	
Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos-Vermiculite-Containing Mate	Item 198.8 of Manual
Lead in Dust Wipes	EPA 6010D
	EPA 7000B
Lead in Paint	EPA 6010D
	EPA 7000B
Polychlorinated Biphenyls	
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Sample Preparation Methods	
	EPA 3050B
	ASTM E-1979-17
	EPA 3546

Serial No.: 66420

Outdoor Selectable-Output Horns, Strobes, and Horn Strobes for Wall Applications

SPECTRAlert ADVANCE from System Sensor

SpectrAlert® Advance outdoor audible visible products are rich with features that cut installation times and maximize profits.

Features

- Weatherproof per NEMA 4X, IP56
- Listed to UL 1638 (strobe) and UL 464 (horn)
- Compatible with System Sensor synchronization protocol and legacy SpectrAlert products
- Field-selectable candela settings: 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, and 185
- Automatic selection of 12- or 24-volt operation at 15 and 15/75 candela
- Rotary switch for horn tone and three volume selections
- Horn rated at 88+ dBA at 16 volts
- Rated from –40°F to 151°F
- Universal mounting plate with an onboard shorting spring that tests wiring continuity before devices are installed
- Plug-in design with minimal intrusion into the back box
- Tamper-resistant construction
- Listed for ceiling or wall mounting

Agency Listings

SIGNALING UL LISTED
S4011 (chimes, horn strobes, horns)
S3593 (outdoor and alert strobes)

FM APPROVED
3023572

MEA approved
MEA452-05-E

7300-1653:187 (outdoor strobes)
7125-1653:188 (horn strobes, chime strobes)
7135-1653:189 (horns, chimes)

SpectrAlert Advance offers the broadest line of outdoor horns, strobes, and horn strobes in the industry. With white or red plastic housings, wall or ceiling mounting options, and plain or FIRE-printed devices, SpectrAlert Advance can meet virtually any application requirement, including indoor, outdoor, wet, and dry applications in temperatures from –40°F to 151°F.

Like the entire SpectrAlert Advance line, outdoor horns, strobes, and horn strobes for wall applications include a variety of features that increase application flexibility and simplify installation. First, field-selectable settings, including candela, automatic selection of 12- or 24-volt operation, horn tones, and three volume options enable installers to easily adapt devices to meet requirements.

Next, SpectrAlert Advance devices use a universal mounting plate for both wall and ceiling applications. This mounting plate includes an onboard shorting spring that ensures wiring continuity before devices are installed, so installers can verify proper wiring without mounting the devices and exposing them to potential construction damage. Once the plates are mounted, all SpectrAlert Advance devices utilize a plug-in design with a single captured screw to speed installation and virtually eliminate costly ground faults.

Outdoor devices ship with weatherproof plastic back boxes (metal back boxes are available separately) that accommodate in-and-out wiring for daisy chaining devices. Plastic back boxes feature removable side flanges and improved resistance to saltwater corrosion. Knock-outs located on the back eliminate the need to drill holes for screw-in mounting. Plastic and metal weatherproof back boxes come with ¾-inch top and bottom conduit entries and ¾-inch knock-outs at the back. A screw-in NPT plug with an O-ring gasket for a watertight seal is included with each back box.

SpectrAlert Advance Outdoor Horn, Strobe, and Horn Strobe Specifications

Architect/Engineer Specifications

General

SpectrAlert Advance outdoor horns, strobes, and horn strobes shall mount to a weatherproof back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance products, when used with the Sync•Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync•Circuit Module, 12-volt-rated notification appliance circuit outputs shall operate between 9 and 17.5 volts; 24-volt-rated notification appliance circuit outputs shall operate between 17 and 33 volts. Outdoor SpectrAlert Advance products shall operate between –40 and 151 degrees Fahrenheit from a regulated DC or full-wave rectified unfiltered power supply. Strobes and horn strobes shall have field-selectable candela settings including 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, and 185.

Strobe

The strobe shall be a System Sensor SpectrAlert Advance Model _____ listed to UL 1971 and shall be approved for fire protective service. The strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The strobe must be installed with its weatherproof back box in order to remain outdoor approved per UL. The strobe shall be suitable for use in wet environments.

Horn Strobe Combination

The horn strobe shall be a System Sensor SpectrAlert Advance Model _____ listed to UL 1971 and UL 464 and shall be approved for fire protective service. The horn strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The horn shall have three audibility options and an option to switch between a temporal three pattern and a non-temporal (continuous) pattern. These options shall be set by a multiple position switch. On four-wire products, the strobe shall be powered independently of the sounder. The horn or horn strobe models shall operate on a coded or non-coded power supply. The horn strobe must be installed with its weatherproof back box in order to remain outdoor approved per UL. The horn strobe shall be suitable for use in wet environments.

Physical/Electrical Specifications

Operating Temperature	–40°F to 151°F (–40°C to 66°C)
Strobe Flash Rate	1 flash per second
Nominal Voltage	Regulated 12 DC/FWR or regulated 24 DC/FWR[1]
Operating Voltage Range[2]	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
Input Terminal Wire Gauge	12 to 18 AWG
Wall-Mount Dimensions (including lens)	5.6″L × 4.7″W × 2.5″D (142 mm L × 119 mm W × 64 mm D)
Horn Dimensions	5.6″L × 4.7″W × 1.3″D (142 mm L × 119 mm W × 33 mm D)
Wall-Mount Weatherproof Back Box Dimensions (SA-WBB)	5.7″L × 5.1″W × 2.0″D (145 mm L × 130 mm W × 51 mm D)

Notes:

1. Full Wave Rectified (FWR) voltage is a non-regulated, time-varying power source that is used on some power supply and panel outputs.
2. P, S, PC, and SC products will operate at 12 V nominal only for 15 and 15/75 cd.

UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)

		8–17.5 Volts		16–33 Volts	
	Candela	DC	FWR	DC	FWR
Standard Candela Range	15	123	128	66	71
	15/75	142	148	77	81
	30	NA	NA	94	96
	75	NA	NA	158	153
	95	NA	NA	181	176
	110	NA	NA	202	195
	115	NA	NA	210	205
High Candela Range	135	NA	NA	228	207
	150	NA	NA	246	220
	177	NA	NA	281	251
	185	NA	NA	286	258

UL Max. Horn Current Draw (mA RMS)

		8–17.5 Volts		16–33 Volts	
Sound Pattern	dB	DC	FWR	DC	FWR
Temporal	High	57	55	69	75
Temporal	Medium	44	49	58	69
Temporal	Low	38	44	44	48
Non-Temporal	High	57	56	69	75
Non-Temporal	Medium	42	50	60	69
Non-Temporal	Low	41	44	50	50
Coded	High	57	55	69	75
Coded	Medium	44	51	56	69
Coded	Low	40	46	52	50

UL Max. Current Draw (mA RMS), 2-Wire Horn Strobe, Standard Candela Range (15–115 cd)

	8–17.5 Volts		16–33 Volts						
DC Input	15	15/75	15	15/75	30	75	95	110	115
Temporal High	137	147	79	90	107	176	194	212	218
Temporal Medium	132	144	69	80	97	157	182	201	210
Temporal Low	132	143	66	77	93	154	179	198	207
Non-Temporal High	141	152	91	100	116	176	201	221	229
Non-Temporal Medium	133	145	75	85	102	163	187	207	216
Non-Temporal Low	131	144	68	79	96	156	182	201	210
FWR Input									
Temporal High	136	155	88	97	112	168	190	210	218
Temporal Medium	129	152	78	88	103	160	184	202	206
Temporal Low	129	151	76	86	101	160	184	194	201
Non-Temporal High	142	161	103	112	126	181	203	221	229
Non-Temporal Medium	134	155	85	95	110	166	189	208	216
Non-Temporal Low	132	154	80	90	105	161	184	202	211

UL Max. Current Draw (mA RMS), 2-Wire Horn Strobe, High Candela Range (135–185 cd)

	16–33 Volts					16–33 Volts			
DC Input	135	150	177	185	FWR Input	135	150	177	185
Temporal High	245	259	290	297	Temporal High	215	231	258	265
Temporal Medium	235	253	288	297	Temporal Medium	209	224	250	258
Temporal Low	232	251	282	292	Temporal Low	207	221	248	256
Non-Temporal High	255	270	303	309	Non-Temporal High	233	248	275	281
Non-Temporal Medium	242	259	293	299	Non-Temporal Medium	219	232	262	267
Non-Temporal Low	238	254	291	295	Non-Temporal Low	214	229	256	262

Candela Derating

For K series products used at low temperatures, listed candela ratings must be reduced in accordance with this table.

Strobe Output (cd)	
Listed Candela	Candela rating at –40°F
15	Do not use below 32°F
15/75	
30	
75	44
95	70
110	110
115	115
135	135
150	150
177	177
185	185

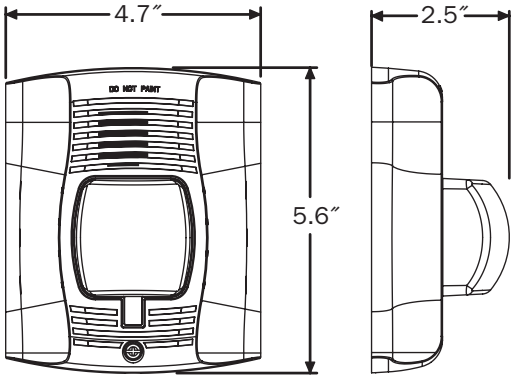
Horn Tones and Sound Output Data

Horn and Horn Strobe Output (dBA)

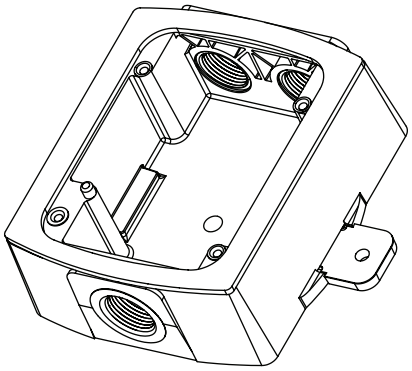
			8–17.5 Volts		16–33 Volts		24-Volt Nominal			
							Reverberant		Anechoic	
Switch Position	Sound Pattern	dB	DC	FWR	DC	FWR	DC	FWR	DC	FWR
1	Temporal	High	78	78	84	84	88	88	99	98
2	Temporal	Medium	74	74	80	80	86	86	96	96
3	Temporal	Low	71	73	76	76	83	80	94	89
4	Non-Temporal	High	82	82	88	88	93	92	100	100
5	Non-Temporal	Medium	78	78	85	85	90	90	98	98
6	Non-Temporal	Low	75	75	81	81	88	84	96	92
7†	Coded	High	82	82	88	88	93	92	101	101
8†	Coded	Medium	78	78	85	85	90	90	97	98
9†	Coded	Low	75	75	81	81	88	85	96	92

†Settings 7, 8, and 9 are not available on 2-wire horn strobe.

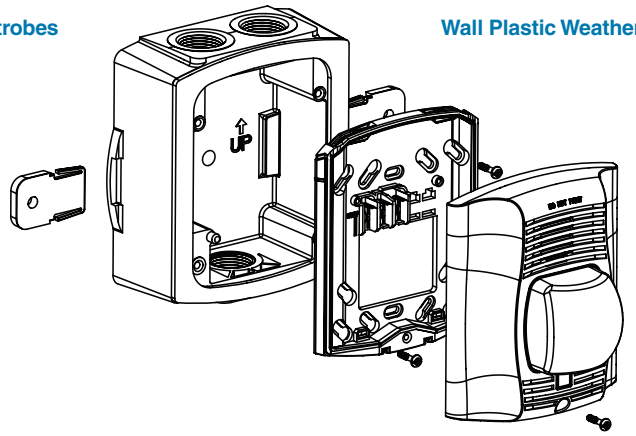
SpectrAlert Advance Diagrams



Wall-Mount Horn Strobes



Wall Plastic Weatherproof Back Box



Wall-Mount Horn Strobe with Plastic Weatherproof Back Box

SpectrAlert Advance Ordering Information

Model	Description
Wall Horn Strobes	
P2RK*†	2-Wire Horn Strobe, Standard cd, Red, Outdoor (includes plastic weatherproof back box)
P2RHK*†	2-Wire Horn Strobe, High cd, Red, Outdoor (includes plastic weatherproof back box)
P2WK*†	2-Wire Horn Strobe, Standard cd, White, Outdoor (includes plastic weatherproof back box)
P2WHK*†	2-Wire Horn Strobe, High cd, White, Outdoor (includes plastic weatherproof back box)
P4RK†	4-Wire Horn Strobe, Standard cd, Red, Outdoor (includes plastic weatherproof back box)
P4WK	4-Wire Horn Strobe, Standard cd, White, Outdoor (includes plastic weatherproof back box)
P2RHK-120	2-Wire Horn Strobe, High cd, Red, Outdoor, 120 V (includes plastic weatherproof back box)
Wall Strobes	
SRK*†	Strobe, Standard cd, Red, Outdoor (includes plastic weatherproof back box)
SRHK*†	Strobe, High cd, Red, Outdoor (includes plastic weatherproof back box)
SWK*†	Strobe, Standard cd, White, Outdoor (includes plastic weatherproof back box)
SWHK*†	Strobe, High cd, White, Outdoor (includes plastic weatherproof back box)
Horns	
HRK†	Horn, Red, Outdoor (includes plastic weatherproof back box)
Accessories	
SA-WBB	Red, Metal Weatherproof Back Box
SA-WBBW	White, Metal Weatherproof Back Box

Notes:

* Add "-P" to model number for plain housing (no "FIRE" marking on cover), e.g., P2RK-P.

† Add "-R" to model number for weatherproof replacement device (no back box included), only for use with weatherproof outdoor flush mounting plate, WTP and WTPW. "Standard cd" refers to strobes that include 15, 15/75, 30, 75, 95, 110, and 115 candela settings. "High cd" refers to strobes that include 135, 150, 177, and 185 candela settings. **When replacing standard outdoor units both the device and back box must be replaced.**

SYSTEM SENSOR®

3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR2 • Fax: 630-377-6495

AVDS01201 • 3/12

SmartCommand System

Addressable Emergency Communication System for Rescue Assistance

Daisy Chained 1-32 Call Box System • Conforms to UL 2525 Standard

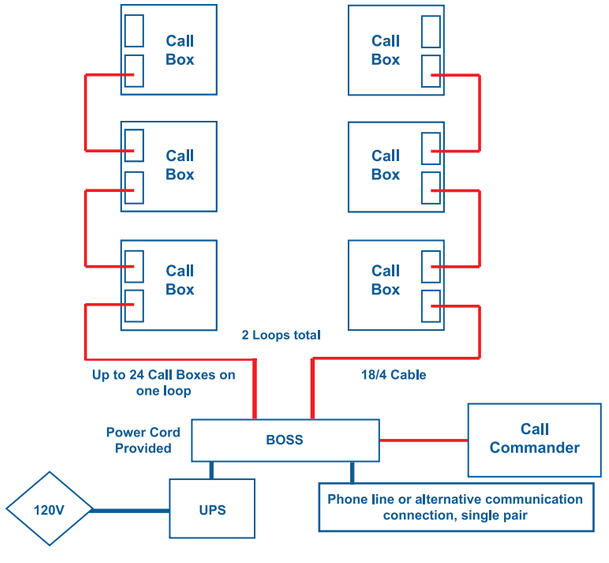
SmartCommand System Standard Components

	 Call Commander	 Call Boxes	 BOSS	 Power Supply	 2 Hour Fire-Rated Cable	 Signage
Part Number(s):	3200_	3300_	3400	1000	66102 (500') 66120 (1000')	Various sizes and styles available
Mounting:	Desk, Flush & Surface	Exterior, Flush & Surface (cover optional)	Rack, Surface & Wall	Shelf or Wall	CI and CIC rated	• Instructional • Illuminated • Door • Directional
Dimensions:	Sizes will vary	Sizes will vary	3.35" H x 17.2" W x 12.3" D	9.22" H x 15.6" W x 8.58" D	Diameter .465"	
Power:	48 vdc from BOSS	48 vdc from BOSS	120 vac	120 vac	N/A	
Wiring:	18/4 Cable	18/4 Cable	18/4 Cable	18/4 Cable	18/4 solid, UL 2196	

All components required by industry standards NFPA, IBC and ADA and warrantied by Rath for 2 years

Visit our website for all system sizes and styles

System Wiring

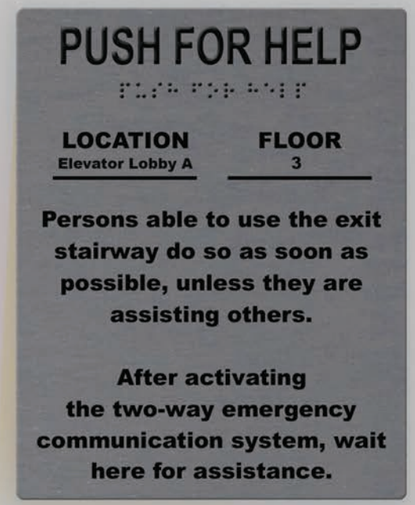


Alternative Communication Options

	 4G Cellular Gateway	 IP Interface
Part Number(s):	AT&T - 2100-LTEGSM4-2 Verizon - 2100-LTEVER4-2	2100-VOIP2CS
Mounting:	Surface or Shelf	Shelf
Dimensions:	4.3" H x 8.3" W x 2.6" D	1.12" H x 4" W x 4" D
Power:	Power Supply included	Power Supply included
Wiring:	Standard FXS port to allow a 2-wire connection	Standard FXS port to allow a 2-wire connection, RJ45 for connection to network

RATH by AVIRE

N56 W24720 N. Corporate Circle · Sussex, WI 53089 | 800-451-1460
www.area-of-refuge.com · www.rathcommunications.com



SmartCommand System

Addressable Emergency Communication System for Rescue Assistance

Daisy Chained 1-32 Call Box System • Conforms to UL 2525 Standard

Two-Way Communication

System allows for two-way communication between Call Boxes and Call Commander or off-site monitoring services

Simple Installation

Centralized programming and daisy chained wiring requires less time and wire, saving cost in labor and materials

Code Compliant

Designed to meet the latest industry standards NFPA 72 2002 (conforms to UL 2525), IBC and ADA ensuring compliance

Safe & Secure

System is engineered to include built-in state-of-the-art 360° Supervision communication capabilities

RATH by AVIRE

SmartCommand System

Addressable Emergency Communication System for Rescue Assistance

Daisy Chained 1-32 Call Box System • Fully Programmable & Supervised
Code Compliant including conforming to UL 2525 Standard

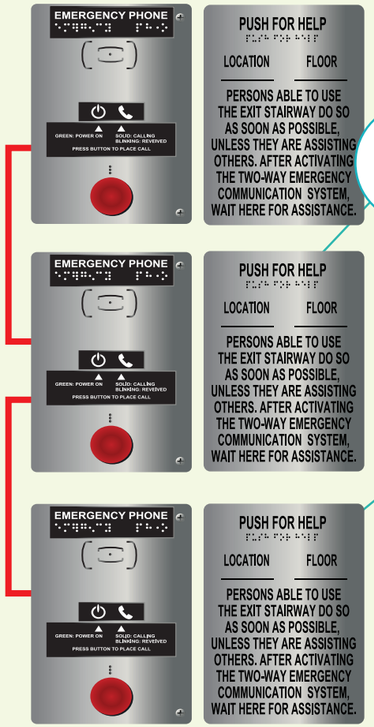
In publicly accessible buildings, during a fire alarm emergency, elevators are inaccessible.
The "Area of Refuge" or "Area of Rescue Assistance" concept was established to provide a safe location for building occupants, who cannot traverse the stairs without assistance, to assemble and await help or instruction from first responders.

An Emergency Communication System for Rescue Assistance is required, by industry standards NFPA, IBC and ADA, at each elevator or bank of elevators, on each accessible floor above/below exit discharge, so the trapped parties can call for rescue assistance

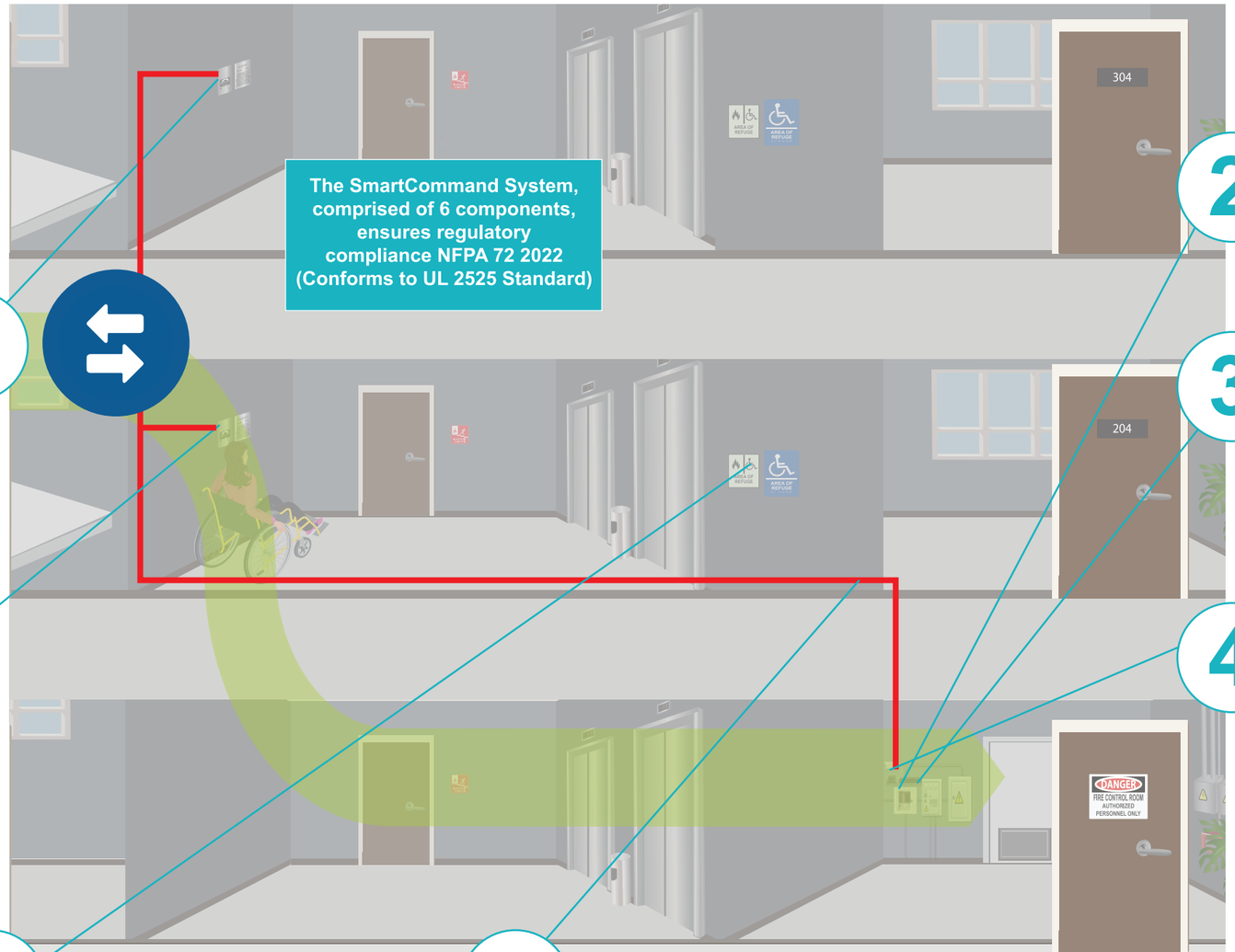
Call Boxes

Required at Areas of Refuge or at every elevator or bank of elevators on every floor above or below exit discharge

Call boxes provide 24/7 hands-free two-way communication for requesting rescue assistance during a fire alarm emergency



Additional requirements of the Call Box
- ADA approved mushroom push button
- Audio at 70Db at 1 meter
- Audible and Visual indicators



On-site Monitoring

Call Commander

Provides a means of communication between the rescue personnel and trapped parties

Displays call box activations in priority order from oldest to newest on a large LCD display

Call boxes can be answered, put on hold, and disconnected from the Call Commander

BOSS

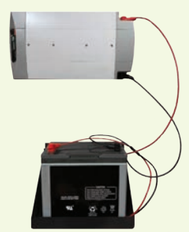
Provides power and communication to the Call boxes and Call Commander through two pair cable

Includes built-in supervision of communication connections and is monitored for integrity (typically) by the fire alarm panel

Primary and Secondary Power Supply

Code requires the primary and secondary power supply must be monitored for the presence of voltage

Battery back-up power for the system must be capable of operating on standby for 24 hours and subsequently for a period of 4 hours of system activation



Signage

Code requirements state that proper signage must be visible indicating location and instructions on the use of the system under emergency conditions

Cable

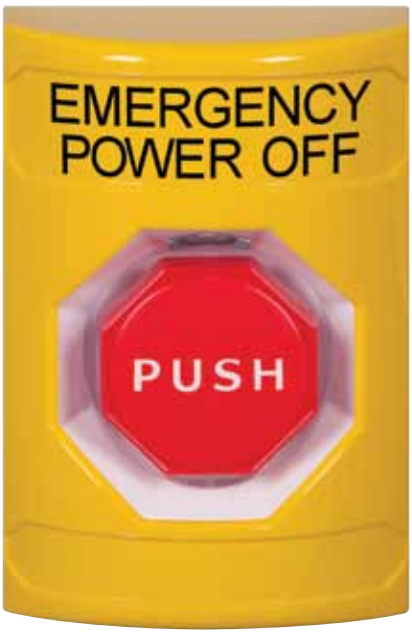
Code provides system pathway survivability requirements that all circuits remain survivable for at least the same time as the fire rating of the building requirements

Off-site Monitoring

Emergency Communication Systems require 24/7 monitoring

If the Call Commander is not at a constantly attended location, the system must call off-site to monitoring or 9-1-1

STI STOPPER®
STATION SERIES



c UL us
ADA Compliant
CE
See Reverse For Details

PRODUCT OVERVIEW

These ADA Compliant, multipurpose push button switches cover a wide range of applications both indoors and outdoors. They're called Stopper Stations. They incorporate a unique, patented design that helps dramatically to stop accidental activation. A number of standard models are available or we can create custom units to meet your needs exactly. You have your choice of any of five universal shell colors, several button styles, standard or custom wording and language.

HOW THEY WORK

Because of their superior, patented design combined with quality construction throughout, you can expect outstanding performance for years to come. In fact, many STI customers are surprised to find that all this quality is available at no increase in price. Plus, customers appreciate the option to protect the switches with STI protective covers that carry a three year guarantee against breakage in normal use, one year on electro mechanical and electronic components. For indoor applications, you can order your Stopper Station with a pre-alarm cover to help stop malicious and accidental activation.

KEY FEATURES

General Information

- Multipurpose push button switches cover a wide range of applications both indoors and outdoors.
- Three year guarantee against breakage of polycarbonate in normal use (one year on electro mechanical and electronic components).

Design

- Unique, curved design helps protect against accidental activation.

Construction

- Station housing molded of tough polycarbonate.
- UL Listed to U.S. and Canadian safety standards.
- Models used with LT-1UL Latching Timer Module are Listed for access control.
- Stainless steel backplate.
- Push buttons are ADA Compliant (excludes "3" key switch button).

Installation

- 5VA flammability rating on backplate and spacer.
- Typical working properties of polycarbonate are -40° to 250°F (-40° to 121°C).
- Polycarbonate complies with FDA regulations for food contact applications.

Options

- Your choice of colors — red, green, yellow, white or blue.
- Standard or custom text or hi-res logo.
- Custom text in any language.
- Protect with STI indoor/outdoor protective covers.

STI Stopper® Station Series

Dimensions and Technical Information

UNIQUE BUTTON FEATURES

Models SS2xy0, SS2xy1, SS2xy3, SS2xy4

- Interchangeable or replaceable N.O. or N.C., SPST gold-plated contact blocks rated for 6 amps @ 600 VAC or 1 amp @ 250 VDC.
- Standard switch includes one N.O. and one N.C. contact. Holds up to three sets of isolated contacts.
- SS2xy0 and SS2xy1 rated for 6000 operations.
- SS2xy4 rated for 100,000 operations.

Note: some standard single gang boxes need additional depth. To add 5/8" depth, order KIT-102722-color (B=blue, G=green, R=red, Y=yellow, W=white, E=orange).

Models SS2xy2, SS2xy5, SS2xy9

- Two (2) Form "C" contacts, DPDT, rated 10 amps @ 125/250 VAC, 1/2 HP, 6 amps @ 30 VDC.
- 12-24VAC/VDC LED (LED red, green, and white).
- Over 100,000 operations.

Model SS2xy6

- Two (2) Form "C" contacts, DPDT, rated 10 amps @ 125/250 VAC, 1/2 HP, 6 amps @ 30 VDC.
- 12-24VAC/VDC LED
- 100,000 operations.

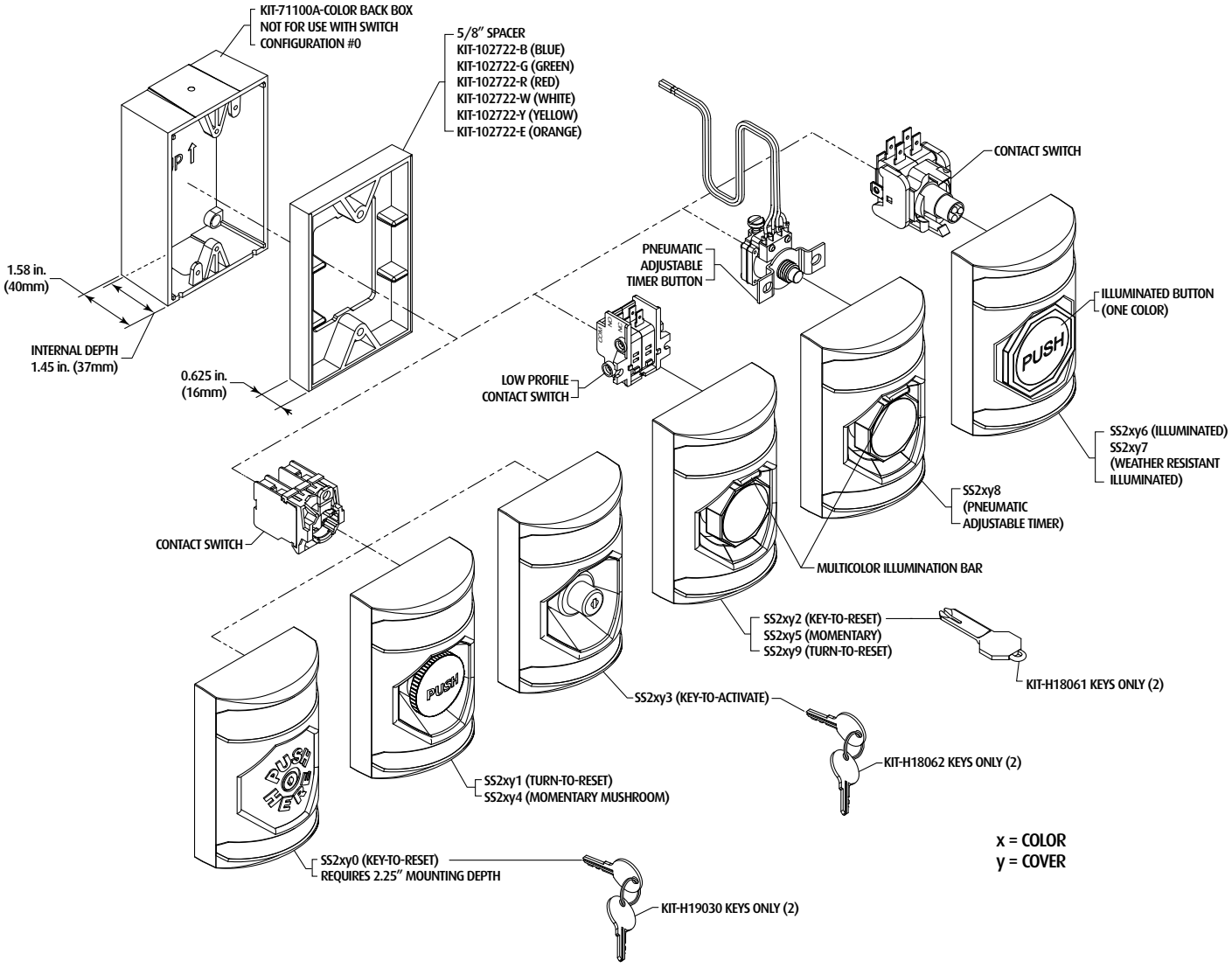
Model SS2xy7

- Two (2) Form "C" contacts, DPDT, rated 10 amps @ 125/250 VAC, 1/2 HP, 6 amps @ 30 VDC, -31°F to 150°F (-35°C to 66°C).
- 12-24VAC/VDC LED
- Weather resistant, suitable for indoor or outdoor use without a cover.
- 100,000 operations.

Model SS2xy8

- Switch rating 10 amps @ 240 VAC resistive and has a timer range: 2 - 60 seconds (± 15%).
- Indoor use only. Not recommended for outdoor/water applications, temperature range of button 15° to 120°F (-9° to +49°C).
- Timer life of over 1,000,000 operations.
- Pneumatic adjustable timer opens or closes a circuit and has a timed delay before reset. No electricity to operate.
- Ideal for security applications.
- 1 Form Z, 1 N.O. and 1 N.C. contact.

***Note:** x = color, y = cover, see page 4 for details.



STI Stopper® Station Series

Dimensions and Technical Information

APPROVALS & WARRANTY

TESTING

It has been tested and approved or listed by:

- UL/cUL File No. S7255
- Complies with UL 2017. UL Listed for indoor and outdoor use ("8" button indoor only, temperature range 15° to 120°F). When mounting outdoor, must use an STI weather cover.
- UL/cUL Type NM suitable for indoor or outdoor use without a cover (#7 button only)
- UL 294 (models used with LT-1UL)
- CSA C22.2 No. 205
- ADA Compliant (excludes "3" button)

WARRANTY

Three year guarantee against breakage of polycarbonate in normal use (one year on electro mechanical and electronic components).

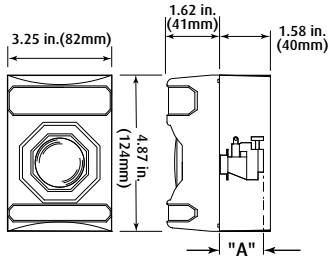
Accessories

LT-1UL	UL Latching/Timer Module
KIT-71100A-*	Back box for 2, 5, 8 and 9 switch
KIT-71101A-*	Back box & Spacer Kit for 1, 3 or 4 switch
KIT-E10196	N.O. contact for 0, 1, 3 or 4 switch
KIT-M10197H	Replacement contact holder for 0, 1, 3 & 4 switch
KIT-E10198	N.C. contact for 0, 1, 3 or 4 switch
KIT-102722-*	Plastic Spacer - adds 5/8" depth
KIT-H19030	Two Extra Keys for 0 switch
KIT-H18061	Two Extra Keys for 2 switch
KIT-H18062	Two Extra Keys for 3 switch

***** R=red, B=blue, G=green, Y=yellow, W=white, E=orange

"A" - Contact Depth	
SS2xy0*	2.16"
SS2xy1	2.04"
SS2xy2	1.00"
SS2xy3*	2.13"
SS2xy4	2.04"
SS2xy5	1.00"
SS2xy6	.875"
SS2xy7	.875"
SS2xy8	1.4"
SS2xy9	1.00"

* If extra depth needed in electrical box order KIT-102722-color.



Covers to protect your STI Stopper Station from damage or weather and to help stop malicious or accidental activation.

Stopper® Station Shield (Cover 2, A)

This inexpensive and highly durable cover, with or without alarm, was invented to mount directly onto the Stopper Station series of buttons with two tabs that snap into the Stopper Station shell. It takes hard knocks in stride while protecting the button against vandalism, damage and accidental activation. Ideal for use when space is limited.

No labeling can be placed on the Stopper Station shield.

Universal Stopper® (Covers 3, 4, 7, 8)

This indoor/outdoor cover helps stop false fire alarms and can protect Stopper Stations against damage as well as malicious or accidental activation. It consists of a clear polycarbonate shield that fits easily over any STI Stopper Station model. When it is lifted to gain access to the Stopper Station, the optional piercing 105 dB warning horn sounds. Legitimate activation is not affected. The protective cover options include: dome or low profile, with or without horn, flush mount, surface mount.

Additional labeling may be placed on the Universal Stopper.

Note:

Stopper Station #7 button is UL/cUL Listed for outdoor use without a cover. All others are approved for outdoor use with an outdoor rated protective cover. Excludes pneumatic button.

STI Stopper® Station Series

Dimensions and Technical Information

SS2 ___ ___ ___ ___ – ___

COLOR
0. Red
1. Green
2. Yellow
3. White
4. Blue
5. Orange

COVER
Flush
3. Universal Stopper, label shell*
4. Universal Stopper, horn*
Surface
7. Universal Stopper, label shell*
8. Universal Stopper, horn*
Flush or Surface
2. Shield
A. Shield with sound
0. No Cover

*Orange coming soon

SWITCH CONFIGURATION
2. Key-to-Reset (Illuminated Bar)
5. Momentary (Illuminated Bar)
9. Turn-to-Reset (Illuminated Bar)
8. Pneumatic (Illuminated Bar)
6. Momentary (Illuminated)
7. Weather Resistant Momentary (Illuminated)
0. Key-to-Reset*
1. Turn-to-Reset
3. Key-to-Activate
4. Momentary

*Not available in orange

LANGUAGE
EN = English
ES = Spanish
FR = French
ZL = Other Language

TEXT
AB = ABORT
EM = EMERGENCY
EX = EMERGENCY EXIT
PO = EMERGENCY POWER OFF
ES = EMERGENCY STOP
EV = EVACUATION
XT = EXIT
PS = FUEL PUMP SHUT-DOWN
HV = HVAC SHUT-DOWN
LD = LOCKDOWN
PX = PUSH TO EXIT
NT = No Text
ZA = Custom Text

CUSTOMIZE YOUR TEXT - text option ZA.

CUSTOM TEXT FOR TOP OF SHELL: 2 LINES, 20 CHARACTERS EACH (INCLUDES SPACES)

CUSTOM TEXT FOR BOTTOM OF SHELL: 1 LINE, 20 CHARACTERS (INCLUDES SPACES)

CUSTOM TEXT COVER 3, 4, 7, 8: 2 LINES, 40 CHARACTERS EACH (INCLUDES SPACES)

White text on blue, red and green; black text on yellow, white and orange.

Safety Technology International

2306 Airport Road
Waterford, Michigan
48327, USA

Tel: 248-673-9898
Fax: 248-673-1246
Toll-free: 800-888-4784
info@sti-usa.com
www.sti-usa.com

Taylor House
34 Sherwood Road
Bromsgrove, Worcestershire
B60 3DR, England

Tel: +44 (0)1527 520 999
Fax: +44 (0)1527 501 999
info@sti-emea.com
www.sti-emea.com

AXIS I8016-LVE Network Video Intercom

Compact and robust video intercom

AXIS I8016-LVE Network Video Intercom is a compact and highly robust network intercom designed for two-way communication, video identification, and remote entry control. It offers 5 MP resolution with invisible IR night vision, and exceptional audio volume with echo and noise cancellation to ensure reliable 24/7 identification even in the most demanding situations. Based on open IP standards and interfaces, this network intercom offers great integration possibilities and is a perfect complement to any video surveillance system. Furthermore, it features multiple inputs and outputs for remote control of door locks and other equipment.

- > High-quality audio and video
- > Easy installation with PoE
- > Open interface with IP phone integration, SIP support
- > Anti-ligature, vandal-resistant IK10-rated
- > IP66/IP69-rated with wall-mount

AXIS I8016-LVE Network Video Intercom

Camera

Image sensor	1/2.7" progressive scan RGB CMOS
Lens	1.95 mm, F2.2 Horizontal field of view: 140° Vertical field of view: 114° M12 mount, fixed iris
Day and night	Automatically removable infrared-cut filter
Minimum illumination	**Color:** 0.16 lux at 50 IRE, F2.2 **B/W:** 0.00 lux at 50 IRE, F2.2, with IR illumination on
Shutter speed	1/50000 s to 1/5 s

System on chip (SoC)

Model	ARTPEC-7
Memory	2048 MB RAM, 512 MB Flash

Video

Video compression	H.264 (MPEG-4 Part 10/AVC) Baseline, Main and High Profiles H.265 (MPEG-H Part 2/HEVC) Main Profile Motion JPEG
Resolution	2592x1944 240x160
Frame rate	Up to 30/25 fps (60/50 Hz) in all resolutions
Video streaming	Multiple, individually configurable streams in H.264, H.265 and Motion JPEG Axis Zipstream technology in H.264 and H.265 Controllable frame rate and bandwidth VBR/ABR/MBR H.264/H.265 Video streaming indicator
Image settings	Saturation, contrast, brightness, sharpness, forensic WDR: up to 120 dB depending on scene, white balance, day/night threshold, tone mapping, exposure mode, exposure zones, defogging, compression, text and image overlay, polygon privacy mask

Audio

Audio streaming	Two-way, full duplex Echo cancellation and noise reduction
Audio encoding	24bit LPCM, AAC-LC 8/16 kHz, G.711 PCM 8 kHz, G.726 ADPCM 8 kHz, Opus 8/16 kHz Configurable bit rate
Audio input/output	Line input, line output, built-in microphone (can be disabled), built-in speaker, automatic gain control Built-in speaker 78 dB sound pressure at 1 kHz at 1 m distance (84 dB at 0.5 m / 20 in)

Network

Security	Password protection, IP address filtering, HTTPS[a] encryption, IEEE 802.1x (EAP-TLS)[a] network access control, digest authentication, user access log, centralized certificate management, brute force delay protection, signed firmware, secure boot, signed video, Axis Edge Vault, Axis device ID, secure keystore (CC EAL4 certified), TPM (FIPS 140-2 certified)
Network protocols	IPv4, IPv6 USGv6, ICMPv4/ICMPv6, HTTP, HTTPS[a], HTTP/2, TLS[a], QoS Layer 3 DiffServ, FTP, SFTP, CIFS/SMB, SMTP, mDNS (Bonjour), UPnP®, SNMP v1/v2c/v3 (MIB-II), DNS/DNSv6, DDNS, NTP, RTSP, RTP, SRTP, TCP, UDP, IGMP, RTCP, ICMP, DHCPv4/v6, ARP, SSH, NTCIP, SIP, LLDP, Syslog, Link-Local address (ZeroConf)

System integration

Application Programming Interface	Open API for software integration, including VAPIX® and AXIS Camera Application Platform; specifications at *axis.com* One-click cloud connection ONVIF® Profile G, ONVIF® Profile M, ONVIF® Profile S, and ONVIF® Profile T, specification at *onvif.org*
VoIP	Support for Session Initiation Protocol (SIP) for integration with Voice over IP (VoIP) systems, peer to peer or integrated with SIP/PBX Tested with various SIP software such as Cisco, Bria and Grandstream Tested with various PBX softwares such as Cisco, Avaya and Asterisk Supported SIP features: secondary SIP server, IPv6, SRTP, SIPS, SIP TLS, DTMF (RFC2976 and RFC2833), NAT (ICE, STUN, TURN), Contact list, parallel call forking, sequential call forking Supported codecs: PCMU, PCMA, opus, L16/16000, L16/8000, speex/8000, speex/16000, G.726-32, G.722
Event triggers	Analytics, external input, edge storage events, virtual inputs through API Call: DTMF, state, state changes Detectors: audio detection, live stream accessed, shock detection, tampering, motion alarm Hardware: Casing open, temperature, relays and outputs, network Input Signal: digital input port, manual trigger, virtual inputs MQTT subscribe Storage: disruption, recording System: system ready Time: recurrence, use schedule PTZ: moving, preset reached
Event actions	Axis door control Make call: SIP, API Terminate call: SIP, API Record video and audio: SD card and network share Upload of images or video clips: FTP, SFTP, HTTP, HTTPS, network share, and email Pre- and post-alarm video or image buffering for recording or upload Notification: email, HTTP, HTTPS and TCP External output activation, play audio clip, overlay text, PTZ controls, status LED, WDR mode MQTT publish
Data streaming	Event data

Analytics

Applications	**Included** AXIS Video Motion Detection Support for AXIS Camera Application Platform enabling installation of third-party applications, see *axis.com/acap*

General

Casing	Anti-ligature, IP66/IP69-, NEMA 4X- and IK10-rated Stainless steel, zink, and plastic casing Color: black NCS S 9000-N For repainting instructions of skin cover or casing and impact on warranty, contact your Axis partner. This product can be repainted
Mounting	Recessed mounting using US 2-Gang-, 4 inch square installation boxes or AXIS TI8202 Recessed Mount Wall Mounting using AXIS TI8602 Wall Mount Wall Mounting with conduit pipe using AXIS TI8602 Wall Mount and AXIS TI8603 Conduit Adapter
Power	Power over Ethernet (PoE) IEEE 802.3af/802.3at Type 1 Class 3 Typical 4.7 W, max 12.7 W **Relay rating:** 30 V, 0.7 A
Connectors	Shielded RJ45 10BASE-T/100BASE-TX PoE I/O: 6-pin terminal block for 2 inputs/outputs, +12 V 400 mA supply, and 1 relay 4-pin terminal block for audio input and output
IR illumination	Power-efficient, long-life 940 nm IR LEDs Range of reach 5 m (16 ft) or more depending on the scene
Storage	Support for microSD/microSDHC/microSDXC card and encryption Recording to network-attached storage (NAS) For SD card and NAS recommendations see *axis.com*
Operating conditions	-40 °C to 60 °C (-40 °F to 140 °F) Start-up temperature: -40 °C (-40 °F) Humidity 10–100% RH (condensing)
Storage conditions	-40 °C to 65 °C (-40 °F to 149 °F) Humidity 5–95% RH (non-condensing)
Approvals	**EMC** EN 50121-4, EN 55032 Class A, EN 55035, EN 61000-6-1, EN 61000-6-2, FCC Part 15 Subpart B Class A, ICES-3(A)/NMB-3(A), IEC 62236-4, KC KN32 Class A, KC KN35, RCM AS/NZS CISPR 32 Class A, VCCI Class A **Safety** CAN/CSA-C22.2 No. 60950-22, CAN/CSA C22.2 No. 62368-1, IEC/EN/UL 62368-1,IEC/EN/UL 60950-22, IEC 62471 **Environment**

	IEC 60068-2-27, IEC 60068-2-6, IEC/EN 60529 IP66/IP69, IEC/EN 62262 IK10, NEMA 250 Type 4X **Network** NIST SP500-267
Dimensions	Height: 124 mm (4.9 in) Width: 124 mm (4.9 in)
Weight	900 g (2.0 lb)
Included accessories	Installation guide, Windows® decoder 1-user license, terminal block connector, Allen key (Resitorx 10)
Optional accessories	AXIS TI8202 Recessed Mount AXIS TI8602 Wall Mount AXIS TI8603 Conduit Adapter AXIS TI8902 Glass Replacement Kit AXIS TI8901 Face Plate Replacement AXIS A9801 Security Relay For more accessories, see *axis.com*
Video management software	AXIS Companion, AXIS Camera Station, video management software from Axis Application Development Partners available at *axis.com/vms*
Languages	English, German, French, Spanish, Italian
Warranty	5–year warranty, see *axis.com/warranty*

a. *This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (openssl.org), and cryptographic software written by Eric Young (eay@cryptsoft.com).*

Environmental responsibility:

axis.com/environmental-responsibility

H5A MULTISENSOR CAMERA

9 MP | 12 MP | 15 MP | 20 MP | 24 MP | 32 MP

The Avigilon H5A Multisensor camera helps ensure your site is covered from all angles by combining Next-Generation Video Analytics and three or four adjustable sensors into one powerful solution. Monitor virtually any area in all lighting conditions with up to 360-degree views from a single camera. This makes the H5A Multisensor perfect for securing wide areas, including outdoor building corners, parking lots, crossroads, as well as indoor areas with high ceilings, long corridors and hallway intersections.

FEATURES

NEXT-GENERATION VIDEO ANALYTICS

Detects more objects with expanded object classifications and greater accuracy for faster responses, even in crowded scenes.

IMPACT, WATER, DUST & CORROSION PROTECTION

Protects against impact, water, windblown dust and a degree of corrosion with IK10, IP66/67, NEMA Type 4X and TS2 ratings.

ONVIF® COMPLIANT

ONVIF Profile S and T compliance enables easy integration with existing ONVIF infrastructures. Profile G compliance supports search, playback and retrieval of recordings on the edge, while Profile M allows for cross-functionality with third-party analytic solutions.

VARIFOCAL LENSES

Enables you to customize the field of view to optimally protect your site, while lens distortion correction provides a seamless viewing experience.

FIPS 140-2 COMPLIANT WITH INTEGRATED TPM

Meets the high data security standards required by federal government agencies and heavily regulated enterprises with FIPS-compliant cryptography support, integrated TPM and Secure Boot.

HIGH-QUALITY IMAGES IN ALL LIGHTING

Sees clearly in the most challenging lighting conditions with faster frame rates, improved Wide Dynamic Range and optional IR illumination.

MOTOROLA SOLUTIONS

AVIGILON

SPECIFICATIONS

IMAGE PERFORMANCE		3.0 MP	5.0 MP	4K (8.0 MP)
Image Sensor		1/2.8" CMOS		1/2.8" CMOS
Active Pixels		1920 (H) x 1080 (V) (16:9) 2048 (H) x 1536 (V) (4:3)	2560 x 1440 (16:9) 2592 x 1944 (4:3)	3840 x 2160 (16:9) 2880 x 2160 (4:3)
3 x Image Sensor, Max Resolution (per image sensor)		5760 (H) x 1080 (V) (16:9) 6144 (H) x 1536 (V) (4:3)	7680 x 1440 (16:9) 7776 x 1944 (4:3)	11520 x 2160 (16:9) 8640 x 2160 (4:3)
4 x Image Sensor, Max Resolution (per image sensor)		7680 (H) x 1080 (V) (16:9) 8192 (H) x 1536 (V) (4:3)	10240 x 1440 (16:9) 10368 x 1944 (4:3)	15360 x 2160 (16:9) 11520 x 2160 (4:3)
Sensor Aspect Ratio		4:3	4:3	16:9
IR Illumination - Optional (high power 850 nm LEDs)[1]		30 m (98 ft) maximum distance at 0 lux when camera is mounted at 4 m (13 ft) off the ground		
Minimum Illumination		0.020 lux (F1.5) in color mode 0.018 lux (F1.5) in mono mode 0 lux with optional IR illuminator		0.020 lux (F1.5) in color mode 0.016 lux (F1.5) in mono mode 0 lux with optional IR illuminator
Dynamic Range	WDR On	120 dB, true WDR, dual exposure		
	WDR Off	80 dB		
3D Noise Reduction Filter		Yes		
Image Rate-Analytics Enabled on All Sensors[2]:				
3 x Image Sensor (60 Hz, 50 Hz)		30 / 25 fps	30 / 25 fps	24 / 20 fps
4 x Image Sensor (60 Hz, 50 Hz)		30 / 25 fps	24 / 25 fps	17 / 16 fps
Image Rate-High Framerate Mode[3]:				
3 x Image Sensor (60 Hz, 50 Hz)		60 / 50 fps	40 / 33 fps	24 / 25 fps
4 x Image Sensor (60 Hz, 50 Hz)		40 / 33 fps	30 / 25 fps	20 / 20 fps

[1] The IR intensity is based on supplied PoE power.

[2] Full Feature Mode: Analytics and WDR enabled with H.265.

[3] High Frame Rate Mode: Analytics disabled with H.265. Max frame rate with WDR enabled is 30 fps.

IMAGE CONTROL	
Image Compression Method	H.264 HDSM SmartCodec, H.265 HDSM SmartCodec, Motion JPEG
Streaming	Multi-stream H.264, Multi-stream H.265, Motion JPEG
Motion Detection	Selectable sensitivity and threshold
Electronic Shutter Control	Automatic, Manual (1/7.5 to 1/8000 sec)
Iris Control	Fixed
Day/Night Control	Automatic, Manual
Flicker Control	60 Hz, 50 Hz
White Balance	Automatic, Manual
Backlight Compensation	Adjustable
Privacy Zones	Up to 64 zones

LENS (PER IMAGE SENSOR)	3.0 MP	5.0 MP	4K (8.0 MP)
Lens and Horizontal Field of View Based on Aspect Ratio	53° - 97° (16:9) 53° - 99° (4:3)		58° - 106° (16:9) 43° - 74° (4:3)
Lens and Vertical Field of View Based on Aspect Ratio	29° - 50° (16:9) 39° - 69° (4:3)		32° - 55° (16:9) 32° - 55° (4:3)
Aperture Range	F1.5 - F1.9		
Control	Fixed Iris, Remote Focus and Zoom		

NETWORK	
Network	Gigabit Ethernet, 100BASE-TX, 1000BASE-TX
Cabling Type	CAT5E
Connector	RJ-45
API	ONVIF® compliance Profile S, T, M, and G (www.onvif.org)
Security	Signed and encrypted firmware, password protection, HTTPS encryption, digest authentication, WS authentication, user access log, 802.1x port based authentication, TLS1.3, FIPS140-2 Level 3 via onboard TPM
Secure Boot	Yes
Protocol	IPv4, IPv6, HTTP, HTTPS, SOAP, DNS, NTP, RTSP, RTCP, RTP, TCP, UDP, IGMPv2, ICMP, DHCP, Zeroconf, ARP, HSTS
Streaming Protocols	RTP/UDP, RTP/UDP multicast, RTP/RTSP/TCP, RTP/RTSP/HTTP/TCP, RTP/RTSP/HTTPS/TCP, HTTP
Device Management Protocols	SNMP v2c, SNMP v3

PERIPHERALS	
USB Port	USB 2.0
Onboard Storage	Dual MicroSD/microSDHC/microSDXC slot - video speed class card required. Class V10 or better recommended. The dual SD cards will work as one contiguous region of storage.

AUXILIARY I/O	
Audio Compression Method	G.711 PCM 8 kHz, Opus
Audio Input/Output	Line level input and output
External I/O Terminal	Alarm In, Alarm Out

ELECTRICAL	IN-CEILING	SURFACE MOUNT	PENDANT MOUNT
Power Consumption	26 W with 24 VDC 37 VA with 24 VAC 25.5 W with IEE 802.3at Type 2 (PoE+)	With IR: 52 W with 24 VDC 74 VA with 24 VAC 51 W with high power PoE (PoE++) Without IR: 26 W with 24 VDC 37 VA with 24 VAC 25.5 W with IEEE 802.3at Type 2 (PoE+)	With IR: 52 W with 24 VDC 74 VA with 24 VAC 51 W with high power PoE (PoE++) Without IR: 26 W with 24 VDC 37 VA with 24 VAC 25.5 W with IEEE 802.3at Type 2 (PoE+)
External Power	24 VDC ± 10 %; 24 VAC rms ± 10 %, 50 or 60 Hz		
PoE*	30 W IEEE 802.3at Type 2 (PoE+)	With IR: 60 W (PoE++): IEEE 802.3bt Type 3, Cisco® UPoE or legacy high-power PoE* Up to 35% IR Power or without IR: 30 W IEEE 802.3at Type 2 (PoE+)	
Redundant Power	Seamless failover between PoE and Aux and back without interruption in camera operation		

* Supported high power PoE products are listed in the **Optional Injectors and Switches** Section and may require adjusting the PoE mode switch. Contact sales or technical support for more information.

MECHANICAL	IN-CEILING	SURFACE MOUNT	PENDANT MOUNT
Dimension	Overall: 298 mm x 161 mm (11.75" x 6.33") Below mounting surface: 298 mm x 64 mm (11.75" x 2.52")	304 mm x 114 mm (11.95" x 4.48")	With wall arm: 385 mm x 262 mm x 299 mm (15.15" x 10.30" x 11.77") With NPT adapter: 299 mm x 248 mm (11.77" x 9.76")
Weight	Mount: 1100 g (2.4 lbs) Bezel: 490 g (1.1 lbs) Camera Module (4 lenses): 1590 g (3.5 lbs)	Mount: 950 g (2.1 lbs) Bezel: 1250 g (2.8 lbs) Camera Module (4 lenses): 1590 g (3.5 lbs) Optional IR Illuminator Ring: 670 g (1.5 lbs)	Wall Mount: 1190 g (2.6 lbs) NPT Adapter Mount: 470 g (1.04 lbs) Pendant: 1680 g (3.7 lbs) Bezel: 1250 g (2.8 lbs) Camera Module (4 lenses): 1590 g (3.5 lbs) Optional IR Illuminator Ring: 670 g (1.5 lbs)

MECHANICAL	IN-CEILING	SURFACE MOUNT	PENDANT MOUNT
Body	Aluminum, Plastic dome trim	Aluminum	Aluminum
Finish	Plastic, Injection Molded, Pantone 427C	Cast, Anodized and Powder Coated, Pantone 427C	Cast, Anodized and Powder Coated, Pantone 427C
Optional IR Illuminator Ring	Not available	Optional accessory, 30 m (98 ft) IR range	

ENVIRONMENTAL	IN-CEILING	SURFACE MOUNT	PENDANT MOUNT
Operating Temperature	-10 °C to +50 °C (14 °F to 122 °F)	-40 °C to +60 °C (-40 °F to 140 °F)	
Storage Temperature	-30 °C to +70 °C (-22 °F to 158 °F)		
Humidity	0 - 95% non-condensing		
IR Illumination Behavior	Not available	The IR illuminator will operate at 100% power from -40 °C to 44 °C (-40 °F to 111 °F). The IR power will reduce to 60% from 44 °C to 53 °C (111 °F to 127 °F). The IR illuminator will turn off when the temperature is greater than 53 °C (127 °F). Hysteresis: 6 °C (10.8 °F). For 25.5 W PoE+, the IR illuminator will operate at only 35% power and will turn off if the temperature is below -26 °C (-15 °F).	

PER SENSOR	
Tilt	+7° to 96° from horizon
Pan	+/-120° (depending on position of image sensors)
Azimuth	+/-180°

CERTIFICATIONS	IN-CEILING	SURFACE MOUNT	PENDANT MOUNT
Certifications/Approvals	UL, cUL, CE, ROHS, RCM, BIS, UKCA, NOM, KC		
Safety Standards	UL 62368-1, CSA 62368-1, IEC/EN 62368-1		
	UL 2043 (Plenum)	IEC/EN 62471	
Environmental Standards/Ratings	IEC 60529 IP5X rating (dust only)	IEC 60529 IP66, IP67 rating IEC/EN 62262 Impact (IK 10) IEC/EN 60068-2-6 Product Vibration IEC/EN 60068-2-27 Product Shock Type 4X	
Electromagnetic Emissions Standards	FCC Part 15 Subpart B (Class A) ICES-003 (Class A) EN 55032 (Class A) EN 61000-3-2 EN 61000-3-3		
Electromagnetic Immunity Standards	EN 55035 EN 61000-6-1 EN 50121-4 EN 50130-4		
NEMA TS2	Not applicable	NEMA TS2 paragraph 2.2.7 - 2.2.9	

SUPPORTED ANALYTICS EVENTS	
Objects in Area	The event is triggered when the selected object type moves into the region of interest.
Object Loitering	The event is triggered when the selected object type stays within the region of interest for an extended amount of time.
Objects Crossing Beam	The event is triggered when the specified number of objects have crossed the directional beam that is configured over the camera's field of view. The beam can be unidirectional or bidirectional.
Object Appears or Enters Area	The event is triggered by each object that enters the region of interest. This event can be used to count objects.
Object Not Present in Area	The event is triggered when no objects are present in the region of interest.
Objects Enter Area	The event is triggered when the specified number of objects have entered the region of interest.
Objects Leave Area	The event is triggered when the specified number of objects have left the region of interest.
Object Stops in Area	The event is triggered when an object in a region of interest stops moving for the specified threshold time.
Object Too Close	The event is triggered when an object moves to within a certain threshold distance of another object.

SUPPORTED ANALYTICS EVENTS	
Direction Violated	The event is triggered when an object moves in the prohibited direction of travel.
Tamper Detection	The event is triggered when the scene unexpectedly changes.

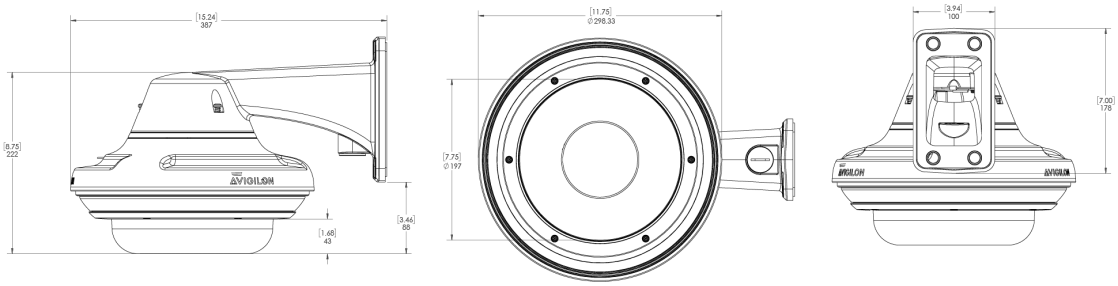
SUPPORTED CLASSIFIED OBJECT TYPES	
Object Types in Outdoor Mode	Person and Vehicle, sub-types: Car, Truck, Bicycle, Motorcycle, Bus
Object Types in Indoor Mode	Person

TEACH BY EXAMPLE	
Object Types Teach By Example in Outdoor Mode	Yes, when used with Avigilon Control Center™.

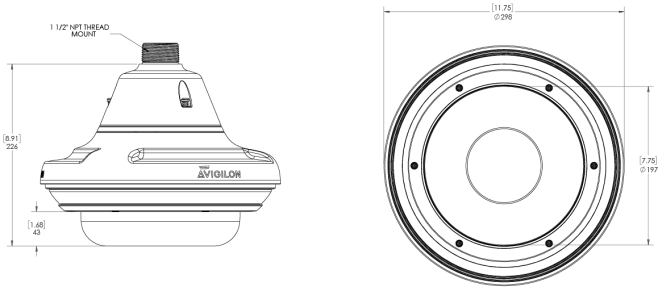
OUTLINE DIMENSIONS

[X.X]	INCHES
X	MM

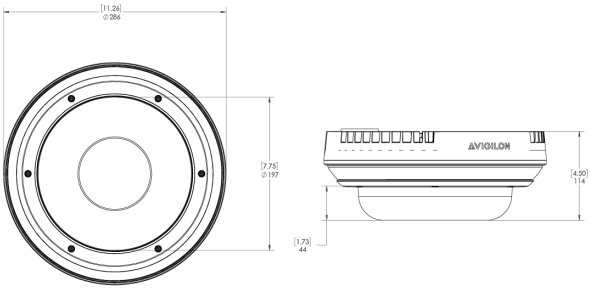
PENDANT WALL MOUNT



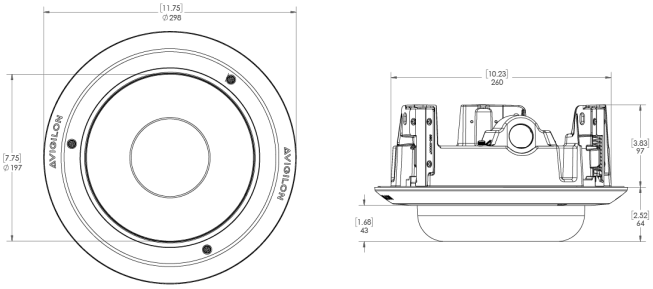
PENDANT NTP MOUNT



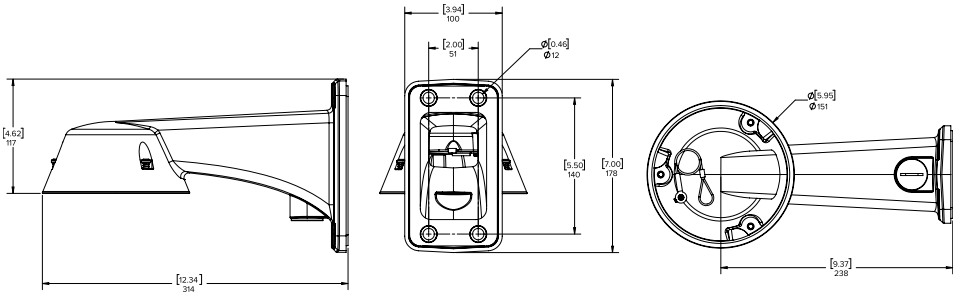
SURFACE MOUNT



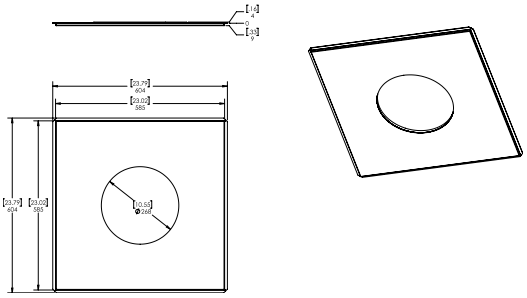
IN-CEILING MOUNT



WALL MOUNT



METAL CEILING PANEL



ORDERING INFORMATION

The variety of mounting options for the H5A Multisensor provides maximum flexibility. All the available camera modules can be used in any of the mounting options.

MOUNTING SCENARIO		ORDERING INFORMATION
PENDANT WALL MOUNT		Order one of: • Camera module • H5AMH-AD-PEND1 • H5AMH-DO-COVR1 or H5AMH-DO-COVR1-SMOKE • WLMT-1001 • Optional, H4AMH-AD-IRIL1
PENDANT NPT MOUNT		Order one of: • Camera module • H5AMH-AD-PEND1 • H5AMH-DO-COVR1 or H5AMH-DO-COVR1-SMOKE • NPTA-1001 • Optional, H4AMH-AD-IRIL1
SURFACE MOUNT		Order one of: • Camera module • H5AMH-AD-DOME1 • H5AMH-DO-COVR1 or H5AMH-DO-COVR1-SMOKE • Optional, H4AMH-AD-IRIL1
IN-CEILING MOUNT		Order one of: • Camera module • H4AMH-AD-CEIL1 • H5AMH-DC-COVR1 or H5AMH-DC-COVR1-SMOKE • Optional, CLPNL-1001 if ceiling panel is needed

CAMERA MODULES

With the modular design of the H5A Multisensor, any camera module can be paired with any mounting adapter for maximum versatility and optimal installation. Each camera module must be ordered with a matching mounting adapter and dome cover.

DISPLAY PART NUMBER	DESCRIPTION
9C-H5A-3MH	3X3MP, WDR, 270 degree max field of view, Lightcatcher, 3.3-5.7MM, Camera Only
12C-H5A-4MH	4X3MP, WDR, 360 degree max field of view, Lightcatcher, 3.3-5.7MM, Camera Only
15C-H5A-3MH	3X5MP, WDR, 270 degree max field of view, Lightcatcher, 3.3-5.7MM, Camera Only
20C-H5A-4MH	4X5MP, WDR, 360 degree max field of view, Lightcatcher, 3.3-5.7MM, Camera Only
24C-H5A-3MH	3X8MP, WDR, 270 degree max field of view, Lightcatcher, 3.3-5.7MM, Camera Only
32C-H5A-4MH	4X8MP, WDR, 360 degree max field of view, Lightcatcher, 3.3-5.7MM, Camera Only

MOUNTING ADAPTERS AND DOME COVERS

The H5A Multisensor modular design provides pendant, surface, or in-ceiling mounting adapters and a choice of two dome covers compatible with all the H5A Multisensor camera modules.

DISPLAY PART NUMBER	DESCRIPTION
H5AMH-AD-DOME1	Outdoor surface mount adapter, must order either a H5AMH-DO-COVR1 or H5AMH-DO-COVR1-SMOKE.
H5AMH-AD-PEND1	Outdoor pendant mount adapter, must order one of WLMT-1001 or NPTA-1001 and one of H5AMH-DO-COVR1 or H5AMH-DO-COVR1-SMOKE.
H5AMH-AD-CEIL1	In-ceiling adapter, must order either a H5AMH-DC-COVR1 or H5AMH-DC-COVR1-SMOKE.
H5AMH-DO-COVR1	Dome bubble and cover, for outdoor surface mount or pendant mount, clear.
H5AMH-DO-COVR1-SMOKE	Dome bubble and cover, for outdoor surface mount or pendant mount, smoked. Not recommended for low light applications.
H5AMH-DC-COVR1	Dome bubble and cover, for in-ceiling mount, clear.
H5AMH-DC-COVR1-SMOKE	Dome bubble and cover, for in-ceiling mount, smoked. Not recommended for low light applications.
WLMT-1001	Pendant wall arm adapter, for use with H5AMH-AD-PEND1.
NPTA-1001	Pendant NPT adapter for use with H5AMH-AD-PEND1.
PLMT-1001	Aluminum pole mounting bracket, compatible with WLMT-1001.
CRNMT-1001	Aluminum corner mounting bracket, compatible with WLMT-1001.
CPNL-1001	Metal ceiling panel.

OPTIONAL IR ILLUMINATOR

The optional IR Illuminator is available for the H5A Multisensor when mounted in a pendant or surface mount adapter.

DISPLAY PART NUMBER	DESCRIPTION
H4AMH-AD-IRIL1	Optional IR illuminator ring, for use with H5AMH-DO-COVR1.

OPTIONAL INJECTORS

DISPLAY PART NUMBER	DESCRIPTION
PD-9001 GR/AT/AC-*-MSI	Indoor single port PoE+ 30W injector. Injector operational temperature range -20 °C to +40 °C (-4 °F to 104 °F).
POE60U-1BTE	Gigabit 802.3bt 60 W PoE Injector, single port.

OPTIONAL ACCESSORIES

DISPLAY PART NUMBER	DESCRIPTION
USB-AC56-NA-MSI / USB-AC56-EU-MSI	USB Wi-Fi adapter.
CBLKT-1001	Cable kit replacement for Multi Head cameras.
CAM-FIPS	Camera license to enable FIPS cryptographic mode on the H5A Multisensor or any H5A camera.

SUPPORT

Learn more and find additional documentation at avigilon.com or email sales@avigilon.com for specific product support.

MOTOROLA SOLUTIONS

AVIGILON

Apr 2023 | Rev 1

H5A CAMERA LINE

2 MP | 4 MP | 5 MP | 6 MP | 8 MP

The Avigilon H5A camera line features our embedded Next-Generation Video Analytics for enhanced object detection, tracking and classification, Unusual Activity Detection (UAD), Facial Recognition technology and support for Avigilon Appearance Search™ technology to help ensure critical events do not go unnoticed. These advanced capabilities help provide detailed information on what is happening on your site so you can detect potentially critical security events faster and take responsive action.

FEATURES

NEXT-GENERATION VIDEO ANALYTICS
Detects more objects with expanded object classification and greater accuracy for faster responses, even in crowded scenes.

H.264 AND H.265 WITH HDSM SMARTCODEC™ TECHNOLOGY
Optimizes compression levels for regions in a scene to help maximize bandwidth savings and keep internet connectivity costs down.

TRUE WIDE DYNAMIC RANGE
Available in all resolutions, capture details in scenes with both very bright and dark areas.

ONVIF® COMPLIANT
ONVIF Profile S, T and G compliance allows easy integration with existing ONVIF infrastructures.

ONVIF is a trademark of Onvif, Inc.

FIPS 140-2 COMPLIANT
Brings increased data security with FIPS-compliant cryptography enabled on cameras[1].

FOCUS OF ATTENTION WITH ACC™ 7
Leverages AI and video analytics technologies to determine what information is important and should be presented to security operators.

LIGHTCATCHER™ TECHNOLOGY
Offers excellent image detail in low-light settings.

MULTIPLE LENS OPTIONS
Choose from various lens types, including long zoom, for flexible coverage options.

[1] Optional purchase of FIPS Level 1 camera license or CRYPTR microSD hardware-based encryption and key management for FIPS Level 3 support and certification.

MOTOROLA SOLUTIONS

AVIGILON

SPECIFICATIONS

IMAGE PERFORMANCE		2.0 MP	4.0 MP	5.0 MP	6.0 MP	8.0 MP (4K ULTRA HD)
Image Sensor		1/2.8" progressive scan CMOS			1/1.8" progressive scan CMOS	
Max Resolution (H x V) and Aspect Ratio		(16:9) 1920 x 1080	(16:9) 2560 x 1440 (4:3) 2304 x 1728	(4:3) 2592 x 1944 (16:9) 2560 x 1440	(16:9) 3200 x 1800 (3:2) 3072 x 2048	(16:9) 3840 x 2160
Dynamic Range	WDR Off	83 dB	83 dB	83 dB	85 dB	85 dB
	WDR On	126 dB (dual exposure, 30 fps) 132 dB (triple exposure, 20 fps or less)	126 dB	126 dB	120 dB	120 dB
Max Image Rate		(50 Hz/60 Hz): 25 fps/30 fps				
Bandwidth Management		HDSM SmartCodec technology; Idle scene mode				
3D Noise Reduction Filter		Yes				

LENS AND IR ILLUMINATION		3.3 – 9 MM	4.9 – 8 MM	9 – 22 MM	4.7 – 84.6 MM
IR Illumination Max Distance[1] (high power 850 nm LEDs)	Dome	35 m (115 ft), full tele 15 m (49 ft), full wide	30 m (98 ft), full tele 15 m (49 ft), full wide	N/A	N/A
	Bullet	50 m (164 ft), full tele 30 m (98 ft), full wide	50 m (164 ft), full tele 30 m (98 ft), full wide	90 m (295 ft), full tele 60 m (197 ft), full wide	N/A
Minimum Illumination	2 MP	0.027 lux in color mode, 0.014 lux in monochrome mode, 0 lux with IR	N/A	0.052 lux in color mode, 0.026 lux in monochrome mode, 0 lux with IR	0.039 lux in color mode, 0.02 lux in monochrome mode
	4 MP	0.03 lux in color mode, 0.015 lux in monochrome mode, 0 lux with IR	N/A	0.058 lux in color mode, 0.029 lux in monochrome mode, 0 lux with IR	N/A
	5 MP	N/A	N/A	0.058 lux in color mode, 0.029 lux in monochrome mode, 0 lux with IR	N/A
	6 MP	N/A	0.055 lux in color mode, 0.028 lux in monochrome mode, 0 lux with IR	N/A	N/A
	8 MP	N/A	0.055 lux in color mode, 0.028 lux in monochrome mode, 0 lux with IR	N/A	N/A
Horizontal Angle of View Based on Aspect Ratio	2 MP	(16:9) 34° – 99°	N/A	(16:9) 14° – 31°	(16:9) 4.1° – 60°
	4 MP	(16:9)(4:3) 34° – 92°	N/A	(16:9) 14° – 31° (4:3) 10° – 24°	N/A
	5 MP	N/A	N/A	(16:9)(4:3) 14° – 31°	N/A
	6 MP	N/A	(16:9) 52° – 92°; (3:2) 41° – 73°	N/A	N/A
	8 MP	N/A	(16:9) 52° – 92°	N/A	N/A
Vertical Angle of View Based on Aspect Ratio	2 MP	(16:9) 18° – 53°	N/A	(16:9) 7.8° – 16.7°	(16:9) 2.3° – 34°
	4 MP	(16:9) 18° – 50° (4:3) 25° – 68°	N/A	(16:9) 8.2° – 17.4° (4:3) 10° – 24°	N/A
	5 MP	N/A	N/A	(16:9) 8.1° – 17.4° (4:3) 11° – 23°	N/A
	6 MP	N/A	(16:9) 29° – 51°; (3:2) 27° – 48°	N/A	N/A
	8 MP	N/A	(16:9) 29° – 51°	N/A	N/A
Max Aperture		F1.3	F1.8	F1.6	F1.6
Control		P-Iris, Remote Focus and Zoom			

[1] IR illumination power may be reduced at higher operating temperatures.

IMAGE CONTROL	
Image Compression Method	H.264 HDSM SmartCodec, H.265 HDSM SmartCodec, Motion JPEG
Streaming	Multi-stream H.264, Multi-stream H.265, Motion JPEG; HDSM™ 2.0 on 4.0 MP, 5.0 MP, 6.0 MP, and 4K (8.0 MP) cameras
Motion Detection	Pixel motion: Selectable sensitivity and threshold. Classified object detection
Camera Tamper Detection	Yes
Electronic Shutter Control	Automatic, Manual (1/7 to 1/8196 sec)
Iris Control	Automatic, Open, Closed
Day/Night Control	Automatic, Manual
Flicker Control	60 Hz, 50 Hz
White Balance	Automatic, Manual
Backlight Compensation	Adjustable
Privacy Zones	Up to 64 zones

NETWORK	
Network	100BASE-TX, RJ45 Connector, CAT5e Cabling
ONVIF	ONVIF compliance version 1.02, 2.00, Profile S, Profile T, Profile G (www.onvif.org)
Security	Password protection, HTTPS encryption, digest authentication, WS authentication, user access log, 802.1x port based authentication, FIPS 140-2 L1 (with optional camera license), FIPS 140-2 L3 (with optional accessory)
Protocols	IPv6, IPv4, HTTP, HTTPS, SOAP, DNS, NTP, RTSP, RTCP, RTP, TCP, UDP, IGMP, ICMP, DHCP, Zeroconf, ARP, HSTS
Streaming Protocols	RTP/UDP, RTP/UDP multicast, RTP/RTSP/TCP, RTP/RTSP/HTTP/TCP, RTP/RTSP/HTTPS/TCP, HTTP
Device Management Protocols	SNMP v2c, SNMP v3

PERIPHERALS		
USB Port		USB 2.0
Onboard Storage	Dome	microSD/microSDHC/microSDXC slot – video speed class card required. Class V10 or better recommended.
	Bullet and Box	SD/SDHC/SDXC slot – video speed class card required. Class V10 or better recommended.

AUXILIARY I/O	
Audio Compression Method	G.711 PCM 8 kHz, Opus
Audio Input/Output	Line level input and output
External I/O Terminals	Alarm In, Alarm Out
RS-485 Terminal	Yes, Box camera only

MECHANICAL (DOME)	INDOOR SURFACE MOUNT	INDOOR IN-CEILING MOUNT	OUTDOOR SURFACE MOUNT
Dimensions (LxWxH)	163 mm x 163 mm x 118 mm; 6.4" x 6.4" x 4.7"	181 mm x 181 mm x 164 mm; 7.1" x 7.1" x 6.5"	163 mm x 163 mm x 121 mm; 6.4" x 6.4" x 4.8"
Weight	0.99 kg (2.18 lbs)	1.64 kg (3.62 lbs)	1.39 kg (3.06 lbs)
Dome Bubble	Polycarbonate		
Body	Plastic, Aluminum		Aluminum
Housing	Surface mount, tamper resistant	Recessed mount, tamper resistant	Surface mount, vandal resistant
Finish	Plastic, injection molded, close to RAL9002	Plastic, gray; Aluminum, powder coat, black	Cast, powder coated, close to RAL9002
Adjustment Range	360° pan, ±180° azimuth, 9° – 95° tilt (30° – 95° with -IR option)		

MECHANICAL (PENDANT DOME)	PENDANT CAMERA ONLY	WITH WALL MOUNT (H4A-MT-WALL1)	WITH NPT MOUNT (H4A-MT-NPTA1)
Dimensions (LxWxH)	172 mm x 172 mm x 124 mm; 6.8" x 6.8" x 4.9"	275 mm x 172 mm x 152.1 mm; 10.8" x 6.8" x 6.0"	172 mm x 172 mm x 172.3 mm; 6.8" x 6.8" x 6.8"

MECHANICAL (PENDANT DOME)	PENDANT CAMERA ONLY	WITH WALL MOUNT (H4A-MT-WALL1)	WITH NPT MOUNT (H4A-MT-NPTA1)
Weight	1.59 kg (3.51 lbs)	3.04 kg (6.70 lbs)	1.84 kg (4.06 lbs)
Dome Bubble	Polycarbonate		
Body	Aluminum		
Housing	Pendant mount, vandal resistant		
Finish	Cast, powder coated, close to RAL9002		
Adjustment Range	360° pan, ±180° azimuth, 9° – 95° tilt (30° – 95° with -IR option)		

MECHANICAL (BULLET)		
Dimensions (LxWxH)		280 mm x 126 mm x 91 mm; 11.04" x 4.97" x 3.58" (including mounting bracket)
Weight	Camera	1.71 kg (3.77 lbs)
	Mounting Bracket	0.21 kg (0.46 lbs)
Body		Aluminum
Housing		Surface mount, tamper resistant
Finish		Cast, powder coated, close to RAL9002
Adjustment Range		±175° pan, ±90° tilt, ±175° azimuth

MECHANICAL (BOX)	
Dimensions (LxWxH)	168 mm x 76 mm x 67 mm; 6.6" x 3.0" x 2.6"
Weight	0.62 kg (1.4 lbs)
Body	Aluminum
Camera Mount	1/4"-20 UNC (top and bottom)
Finish	Cast, powder coated, black

ELECTRICAL				
Power Consumption	Bullet	13 W max		
	Dome	13 W max (11 W with no IR or IR disabled)		
	Box	7 W max		
Power Source	Bullet	VDC: 12 V ± 10%, 13 W min	VAC: 24 V ± 10%, 15 VA min	PoE: IEEE802.3af Class 3 compliant
	Dome	VDC: 12 V ± 10%, 12 W min	VAC: 24 V ± 10%, 13 VA min	PoE: IEEE802.3af Class 3 compliant
	Box	VDC: 12 V ± 10%, 7 W min	VAC: 24 V ± 10%, 9 VA min	PoE: IEEE802.3af Class 3 compliant
RTC Backup Battery		3V manganese lithium		
Memory		2 GB RAM, 512 MB Flash		

ENVIRONMENTAL		
Operating Temperature	Bullet	-40 °C to +60 °C (-40 °F to 140 °F), in enclosed space -40 °C to +65 °C (-40 °F to 149 °F), with ambient convection
	Dome	-40 °C to +65 °C (-40 °F to 149 °F)
	Box	-10 °C to +60 °C (-14 °F to 140 °F)
IR Illuminator Behavior	Bullet	IR illuminator will turn off if the temperature is 61 °C (141 °F) or higher. The illuminator will operate at 50% power if the temperature is between 55 °C (131 °F) and 61 °C (141 °F). Hysteresis: 5 °C (9 °F).
	Indoor Dome	IR illuminator will turn off if the temperature is 55 °C (131 °F) or higher. The illuminator will operate at 50% power if the temperature is between 44 °C (111 °F) and 55 °C (131 °F). Hysteresis: 2 °C (3.6 °F).
	Outdoor Dome	IR illuminator will turn off if the temperature is 57 °C (135 °F) or higher. The illuminator will operate at 50% power if the temperature is between 49 °C (120 °F) and 57 °C (135 °F). Hysteresis: 2 °C (3.6 °F).
Storage Temperature		-10 °C to +70 °C (14 °F to 158 °F)
Humidity		0 - 95% non-condensing

CERTIFICATIONS		
Certifications/Directives		UL, cUL, CE, ROHS, Reach (SVHC), RCM, EAC, BIS, KC, UKCA, NOM
Safety		UL 62368-1, CSA 62368-1, IEC/EN 62368-1, IEC 62471 (with -IR option)
Environmental	Bullet	UL/CSA/IEC 60950-22, IEC 60529 IP66 and IP67 Weather Rating, IEC 62262 IK10 Impact Rating
	Outdoor Dome	UL/CSA/IEC 60950-22, IEC 60529 IP66 and IP67 Weather Rating, IEC 62262 IK10 Impact Rating
	Indoor Dome	IEC 62262 IK10 Impact Rating
Electromagnetic Emissions	Dome and Bullet	FCC Part 15 Subpart B Class B, IC ICES-003 Class B, EN 55032 Class B, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN 50121-4
	Box	FCC Part 15 Subpart B Class B, IC ICES-003 Class B, EN 55032 Class B, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3
Electromagnetic Immunity	Dome and Bullet	EN 55035, EN 61000-6-1, EN 50130-4, EN 50121-4
	Box	EN 55035, EN 61000-6-1

ANALYTICS SPECIFICATIONS

SUPPORTED ANALYTICS EVENTS	
Objects in Area	The event is triggered when the selected object type moves into the region of interest.
Object Loitering	The event is triggered when the selected object type moves into the region of interest and then stays for an extended amount of time.
Objects Crossing Beam	The event is triggered when the specified number of objects have crossed the directional beam that is configured over the camera's field of view. The beam can be unidirectional or bidirectional.
Object Appears or Enters Area	The event is triggered by each object that enters the region of interest. This event can be used to count objects.
Object Not Present in Area	The event is triggered when no objects are present in the region of interest.
Objects Enter Area	The event is triggered when the specified number of objects have entered the region of interest.
Objects Leave Area	The event is triggered when the specified number of objects have left the region of interest.
Object Stops in Area	The event is triggered when an object moves into a region of interest and then stops moving for the specified threshold time.
Direction Violated	The event is triggered when an object moves in the prohibited direction of travel.
Tamper Detection	The event is triggered when the scene unexpectedly changes.

SUPPORTED CLASSIFIED OBJECT TYPES	
Object Types in Outdoor Mode	Vehicle, sub-types: Car, Truck, Bicycle, Motorcycle, Bus Person
Object Types in Indoor Mode	Person

TEACH BY EXAMPLE	
Teach By Example	Yes, when used with Avigilon Control Center™

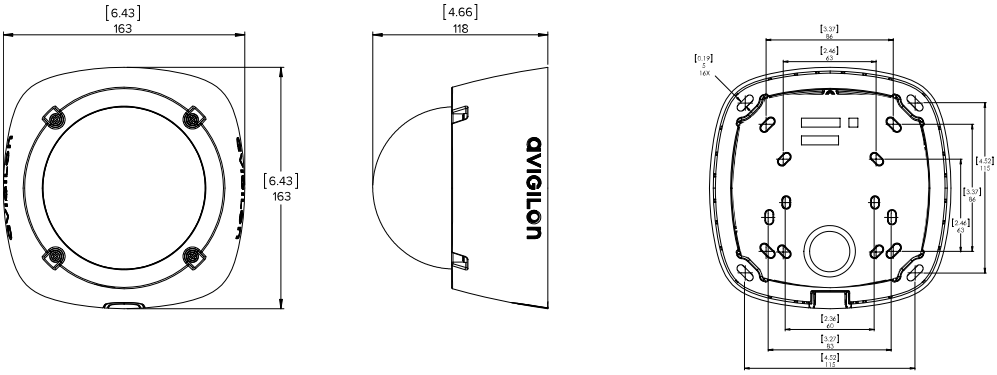
AVIGILON CONTROL CENTER (ACC) VERSIONS SUPPORTED FEATURES	
ACC Version 6.14.12 or higher	All supported analytic events with two types of classified objects: person or vehicle. Appearance search when paired with appropriate server hardware. H.265 supported.
ACC Version 7.2 or higher	All supported analytic events with people and vehicles and all vehicle sub-types as classified objects. Appearance search when paired with appropriate server hardware. H.265 supported.

OUTLINE DIMENSIONS

SURFACE MOUNT INDOOR DOME CAMERA

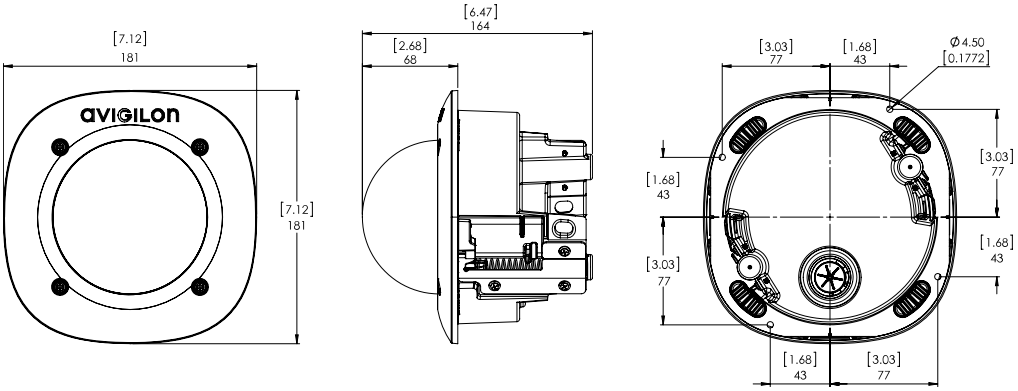
(H5A-D)

[X.X]	INCHES
X	MM



IN-CEILING DOME CAMERA

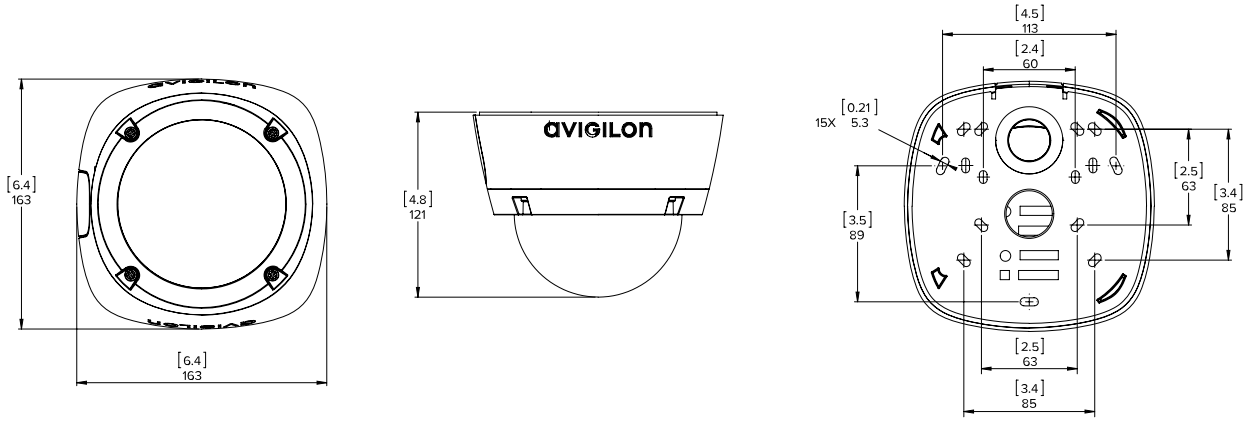
(H5A-DC)



SURFACE MOUNT OUTDOOR DOME CAMERA

(H5A-DO)

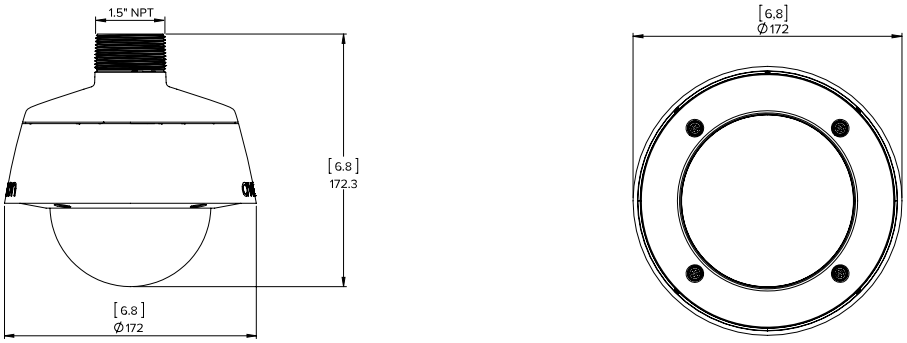
[X.X]	INCHES
X	MM



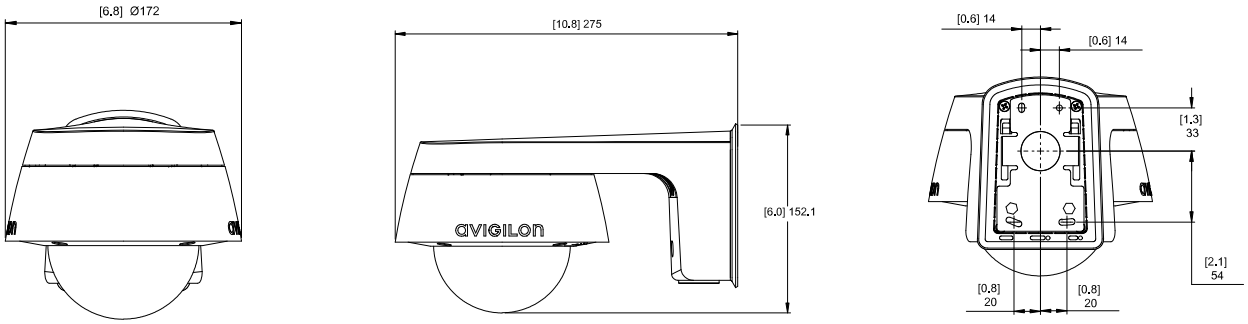
PENDANT DOME CAMERA

(H5A-DP)

WITH MPT MOUNT
(H4A-MT-NPTA1)



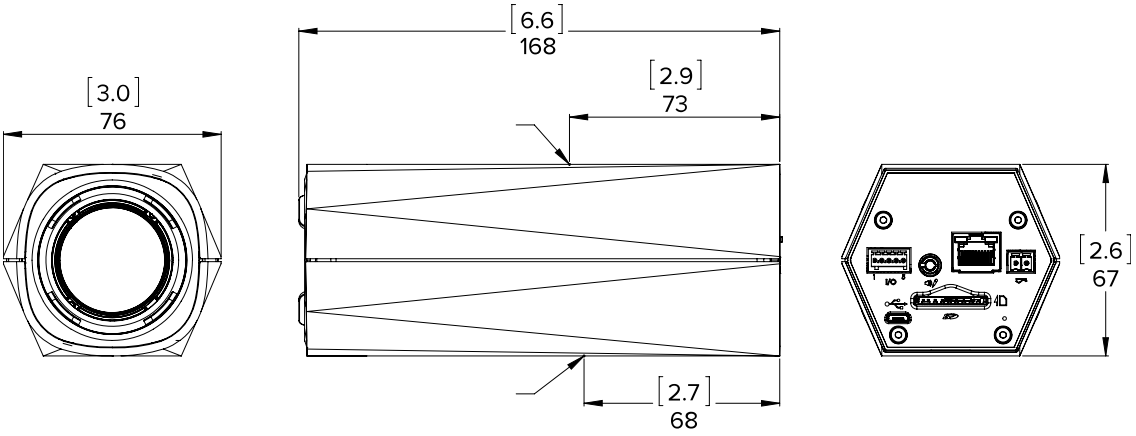
WITH WALL MOUNT
(H4A-MT-WALL1)



BOX CAMERA

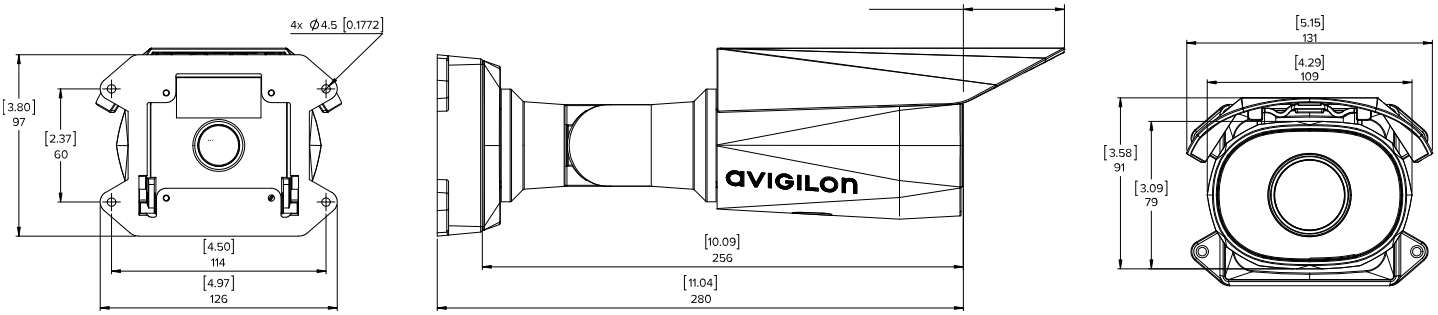
(H5A-B)

[X.X]	INCHES
X	MM



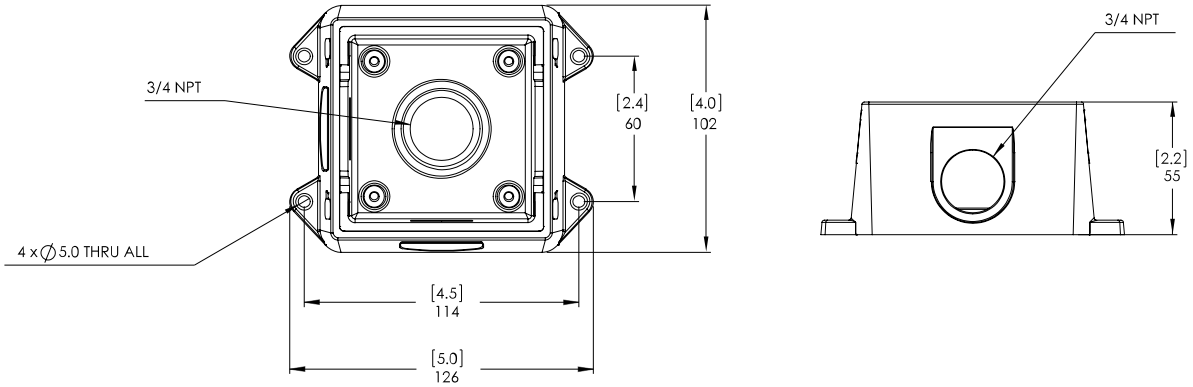
BULLET CAMERA

(H5A-BO-IR)



HD BULLET CAMERA JUNCTION BOX

(H4-BO-JBOX1)



ORDERING INFORMATION

SURFACE MOUNT OUTDOOR DOME CAMERA

(H5A-DO)

	MP	WDR	LIGHTCATCHER TECHNOLOGY	LENS	IR	ANALYTICS	HDSM SMARTCODEC
2.0C-H5A-DO1	2.0	✓	✓	3.3 - 9 mm		✓	✓
2.0C-H5A-DO1-IR	2.0	✓	✓	3.3 - 9 mm	✓	✓	✓
2.0C-H5A-DO2	2.0	✓	✓	9 - 22 mm		✓	✓
4.0C-H5A-DO1	4.0	✓	✓	3.3 - 9 mm		✓	✓
4.0C-H5A-DO1-IR	4.0	✓	✓	3.3 - 9 mm	✓	✓	✓
4.0C-H5A-DO2	4.0	✓	✓	9 - 22 mm		✓	✓
5.0C-H5A-DO2	5.0	✓	✓	9 - 22 mm		✓	✓
6.0C-H5A-DO1	6.0	✓	✓	4.9 - 8 mm		✓	✓
6.0C-H5A-DO1-IR	6.0	✓	✓	4.9 - 8 mm	✓	✓	✓
8.0C-H5A-DO1	8.0	✓	✓	4.9 - 8 mm		✓	✓
8.0C-H5A-DO1-IR	8.0	✓	✓	4.9 - 8 mm	✓	✓	✓

H4A-DO-SMOK1	Outdoor dome camera cover with smoked bubble
H4A-DO-CLER1	Outdoor dome camera cover with clear bubble
H4A-AC-GROM1	Camera sealing grommet, pack of 10
CM-AC-GROM1	Pipe grommet, pack of 10

H4-AC-WIFI2-NA / H4-AC-WIFI2-EU	USB Wi-Fi adapter
CM-AC-AVIO1	3.5 mm jack with 1.8 m fly wire

PENDANT MOUNT OUTDOOR DOME CAMERA

(H5A-DP)

	MP	WDR	LIGHTCATCHER TECHNOLOGY	LENS	IR	ANALYTICS	HDSM SMARTCODEC
2.0C-H5A-DP1	2.0	✓	✓	3.3 - 9 mm		✓	✓
2.0C-H5A-DP1-IR	2.0	✓	✓	3.3 - 9 mm	✓	✓	✓
2.0C-H5A-DP2	2.0	✓	✓	9 - 22 mm		✓	✓
4.0C-H5A-DP1	4.0	✓	✓	3.3 - 9 mm		✓	✓
4.0C-H5A-DP1-IR	4.0	✓	✓	3.3 - 9 mm	✓	✓	✓
4.0C-H5A-DP2	4.0	✓	✓	9 - 22 mm		✓	✓
5.0C-H5A-DP2	5.0	✓	✓	9 - 22 mm		✓	✓
6.0C-H5A-DP1	6.0	✓	✓	4.9 - 8 mm		✓	✓
6.0C-H5A-DP1-IR	6.0	✓	✓	4.9 - 8 mm	✓	✓	✓
8.0C-H5A-DP1	8.0	✓	✓	4.9 - 8 mm		✓	✓
8.0C-H5A-DP1-IR	8.0	✓	✓	4.9 - 8 mm	✓	✓	✓

H4A-DP-SMOK1	Pendant dome camera cover with smoked bubble
H4A-DP-CLER1	Pendant dome camera cover with clear bubble
H4A-MT-WALL1	Indoor/outdoor pendant wall arm mount
H4A-MT-NPTA1	Indoor/outdoor pendant NPT mount
H4-MT-POLE1	Aluminum pole mounting bracket for pendant dome cameras, compatible with H4A-MT-WALL1
H4-MT-CRNR1	Aluminum corner mounting bracket for pendant dome cameras, compatible with H4A-MT-WALL1
CM-AC-GROM1	Pipe grommet, pack of 10
H4-AC-WIFI2-NA / H4-AC-WIFI2-EU	USB Wi-Fi adapter
CM-AC-AVIO1	3.5 mm jack with 1.8 m fly wire

OUTDOOR BULLET CAMERA

	MP	WDR	LIGHTCATCHER TECHNOLOGY	LENS	IR	ANALYTICS	HDSM SMARTCODEC
2.0C-H5A-BO1-IR	2.0	✓	✓	3.3 - 9 mm	✓	✓	✓
2.0C-H5A-BO2-IR	2.0	✓	✓	9 - 22 mm	✓	✓	✓
4.0C-H5A-BO1-IR	4.0	✓	✓	3.3 - 9 mm	✓	✓	✓
4.0C-H5A-BO2-IR	4.0	✓	✓	9 - 22 mm	✓	✓	✓
5.0C-H5A-BO2-IR	5.0	✓	✓	9 - 22 mm	✓	✓	✓
6.0C-H5A-BO1-IR	6.0	✓	✓	4.9 - 8 mm	✓	✓	✓
8.0C-H5A-BO1-IR	8.0	✓	✓	4.9 - 8 mm	✓	✓	✓

H4-BO-JBOX1	Junction box for bullet cameras
H4-MT-POLE1	Aluminum pole mounting bracket for bullet cameras, compatible with H4-BO-JBOX1
H4-MT-CRNR1	Aluminum corner mounting bracket for bullet cameras, compatible with H4-BO-JBOX1
H4-AC-WIFI2-NA / H4-AC-WIFI2-EU	USB Wi-Fi adapter

BOX CAMERA

	MP	WDR	LIGHTCATCHER TECHNOLOGY	LENS	IR	ANALYTICS	HDSM SMARTCODEC
2.0C-H5A-B1	2.0	✓	✓	4.7 - 84.6 mm		✓	✓
2.0C-H5A-B2	2.0	✓	✓	3.3 - 9 mm		✓	✓
4.0C-H5A-B2	4.0	✓	✓	3.3 - 9 mm		✓	✓
4.0C-H5A-B3	4.0	✓	✓	9 - 22 mm		✓	✓
6.0C-H5A-B2	6.0	✓	✓	4.9 - 8 mm		✓	✓
8.0C-H5A-B2	8.0	✓	✓	4.9 - 8 mm		✓	✓

H4-AC-WIFI2-NA / H4-AC-WIFI2-EU	USB Wi-Fi adapter
CM-AC-AVIO1	3.5 mm jack with 1.8 m fly wire

SURFACE MOUNT INDOOR DOME CAMERA

	MP	WDR	LIGHTCATCHER TECHNOLOGY	LENS	IR	ANALYTICS	HDSM SMARTCODEC
2.0C-H5A-D1	2.0	✓	✓	3.3 - 9 mm		✓	✓
2.0C-H5A-D1-IR	2.0	✓	✓	3.3 - 9 mm	✓	✓	✓
2.0C-H5A-D2	2.0	✓	✓	9 - 22 mm		✓	✓
4.0C-H5A-D1	4.0	✓	✓	3.3 - 9 mm		✓	✓
4.0C-H5A-D1-IR	4.0	✓	✓	3.3 - 9 mm	✓	✓	✓
4.0C-H5A-D2	4.0	✓	✓	9 - 22 mm		✓	✓
6.0C-H5A-D1	6.0	✓	✓	4.9 - 8 mm		✓	✓
6.0C-H5A-D1-IR	6.0	✓	✓	4.9 - 8 mm	✓	✓	✓
8.0C-H5A-D1	8.0	✓	✓	4.9 - 8 mm		✓	✓
8.0C-H5A-D1-IR	8.0	✓	✓	4.9 - 8 mm	✓	✓	✓

H4A-DD-SMOK1	Indoor dome camera cover with smoked bubble
H4A-DD-CLER1	Indoor dome camera cover with clear bubble
H4A-DD-SMOK1-BL	Black indoor dome camera cover with smoked bubble
H4A-DD-CLER1-BL	Black indoor dome camera cover with clear bubble
H4A-DD-SDWL1	Indoor dome camera sidewall knockout plug, pack of 5
H4A-DD-SDWL1-BL	Black indoor dome camera sidewall knockout plug, pack of 5
H4-AC-WIFI2-NA / H4-AC-WIFI2-EU	USB Wi-Fi adapter
CM-AC-AVIO1	3.5 mm jack with 1.8 m fly wire

IN-CEILING MOUNT INDOOR DOME CAMERA

	MP	WDR	LIGHTCATCHER TECHNOLOGY	LENS	IR	ANALYTICS	HDSM SMARTCODEC
2.0C-H5A-DC1	2.0	✓	✓	3.3 - 9 mm		✓	✓
2.0C-H5A-DC1-IR	2.0	✓	✓	3.3 - 9 mm	✓	✓	✓
2.0C-H5A-DC2	2.0	✓	✓	9 - 22 mm		✓	✓
4.0C-H5A-DC1	4.0	✓	✓	3.3 - 9 mm		✓	✓
4.0C-H5A-DC1-IR	4.0	✓	✓	3.3 - 9 mm	✓	✓	✓
4.0C-H5A-DC2	4.0	✓	✓	9 - 22 mm		✓	✓
6.0C-H5A-DC1	6.0	✓	✓	4.9 - 8 mm		✓	✓
6.0C-H5A-DC1-IR	6.0	✓	✓	4.9 - 8 mm	✓	✓	✓

	MP	WDR	LIGHTCATCHER TECHNOLOGY	LENS	IR	ANALYTICS	HDSM SMARTCODEC
8.0C-H5A-DC1	8.0	✓	✓	4.9 - 8 mm		✓	✓
8.0C-H5A-DC1-IR	8.0	✓	✓	4.9 - 8 mm	✓	✓	✓

H4A-DC-SMOK1	In-ceiling dome camera cover with smoked bubble
H4A-DC-CLER1	In-ceiling dome camera cover with clear bubble
H4A-DC-SMOK1-BL	Black in-ceiling dome camera cover with smoked bubble
H4A-DC-CLER1-BL	Black in-ceiling dome camera cover with clear bubble
H4-DC-CPNL1	Metal ceiling panel
H4A-AC-GROM1	Camera sealing grommet, pack of 10
H4-AC-WIFI2-NA / H4-AC-WIFI2-EU	USB Wi-Fi adapter
CM-AC-AVIO1	3.5 mm jack with 1.8 m fly wire

OPTIONAL CAMERA LICENSES AND ACCESSORIES

CAM-FIPS	Camera license to enable FIPS Level 1 cryptographic mode on any H5A camera
CAM-FIPS-CRYPTR-L3	MSI CRYPTR SD with camera license to enable FIPS Level 3 cryptographic mode on H5A cameras[1]

[1] Excludes H5A Explosion-Protected camera line.

SUPPORT

Learn more and find additional documentation at avigilon.com or email asksales@avigilon.com for specific product support.

MOTOROLA SOLUTIONS

AVIGILON

Jul 2021 | Rev 15

H5A DUAL HEAD CAMERA

2 x 3 MP 2 x 5 MP

This cost-effective and low profile dual-sensor camera brings enhanced security to any site by increasing coverage and minimizing blind spots for those hard to secure areas. Built with small spaces in mind, the H5A Dual Head provides areas such as hallways, stairwells, and corner intersections, or any application that requires the coverage of two cameras installed in close proximity with high imaging quality, even with its small footprint. The H5A Dual Head camera's advanced analytic capabilities further improve situational awareness by enabling security teams to respond swiftly to potentially critical events.

FEATURES

NEXT-GENERATION VIDEO ANALYTICS
Detects more objects with expanded object classification and greater accuracy for faster responses, even in crowded scenes.

COVID-19 RESPONSE TECHNOLOGY
Features Avigilon video analytics for Occupancy Counting and No Face Mask Detection, supporting facilities' health and safety efforts to curb the spread of COVID-19.

ONVIF® COMPLIANT
Native ONVIF Profile S, T, G, and M compliance allows easy integration with existing ONVIF infrastructures.

ONVIF is a trademark of Onvif, Inc.

IMPROVED COVERAGE, MINIMAL BLIND SPOTS
Provides increased area coverage, while minimizing blind spots for enhanced security with a single camera installation, for long hallways, L-shaped hallway intersections, or stairwells to monitor both up and down staircases.

COST-EFFECTIVE
As a dual-head sensor, sites can lower their overall deployment costs by reducing camera count, network infrastructure, power and cabling, installation labor, and VMS licensing costs.

FIPS 140-2 COMPLIANT
Brings increased data security with FIPS-compliant cryptography enabled on cameras[2].

[2] Optional purchase of FIPS Level 1 camera license or CRYPTR microSD hardware-based encryption and key management for FIPS Level 3 support and certification.

MOTOROLA SOLUTIONS AVIGILON

SPECIFICATIONS

IMAGE PERFORMANCE		2 × 3.0 MP	2 × 5.0 MP
Image Sensor		1/2.7" progressive scan CMOS	
Max Resolution (H x V) and Aspect Ratio		(4:3) 2048 x 1536	(4:3) 2592 x 1944
2x Image Sensor, Max Resolution		4096 x 1536	5184 x 1944
Dynamic Range	WDR Off:	Up to 82 dB	
	WDR On:	Up to 120 dB	
Max Image Rate (60 Hz/50 Hz)	Analytics [1]	24 / 25 fps	15 / 12.5 fps
	High Framerate mode	30 / 25 fps	24 / 20 fps
Bandwidth Management		HDSM SmartCodec technology; Idle scene mode	
3D Noise Reduction Filter		Yes	

[1] Maximum image rate with analytics enabled on all sensors.

LENS AND IR ILLUMINATION	
Lens	3.35 - 7.0 mm, F/1.93 remote focus and zoom, fixed iris
IR Illumination Max Distance[2] (high power 850 nm LEDs)	Wide: 15 m (49 ft) Tele: 30 m (98 ft)
Minimum Illumination	0.1 lux in color mode, 0.05 lux in monochrome mode, 0 lux with IR on
Horizontal Angle of View	43° – 91°
Vertical Angle of View	32° – 67°

[2] IR illumination power may be reduced at higher operating temperatures.

IMAGE CONTROL	
Image Compression Method	H.264 HDSM SmartCodec, H.265 HDSM SmartCodec, Motion JPEG
Streaming	Multi-stream H.264, Multi-stream H.265, Motion JPEG
Motion Detection	Pixel motion: Selectable sensitivity and threshold. Classified object detection
Camera Tamper Detection	Yes, when analytics are enabled
Electronic Shutter Control	Automatic, Manual (1/7.5 to 1/8000 sec)
Iris Control	N/A
Day/Night Control	Automatic, Manual
Flicker Control	50 Hz, 60 Hz
White Balance	Automatic, Manual
Backlight Compensation	Adjustable
Privacy Zones	Up to 64 zones

NETWORK	
Network	100BASE-TX, RJ45 Connector, CAT5e Cabling
ONVIF	ONVIF compliance version Profile S, Profile T, Profile G, and Profile M (www.onvif.org)
Security	Password protection, HTTPS encryption, digest authentication, WS authentication, user access log, 802.1x port based authentication, FIPS 140-2 L1 (with optional camera license)
Protocols	IPv6, IPv4, HTTP, HTTPS, SOAP, DNS, NTP, RTSP, RTCP, RTP, TCP, UDP, IGMPv2, ICMP, DHCP, Zeroconf, ARP, HSTS
Streaming Protocols	RTP/UDP, RTP/UDP multicast, RTP/RTSP/TCP, RTP/RTSP/HTTP/TCP, RTP/RTSP/HTTPS/TCP, HTTP
Device Management Protocols	SNMP v2c, SNMP v3

PERIPHERALS	
USB Port	USB 2.0
Onboard Storage	2 x microSD/microSDHC/microSDXC slots – video speed class card required. Class V10 or better recommended.

AUXILIARY I/O	
Audio Compression Method	Opus, G.711 PCM 8 kHz
Audio Input/Output	Line level input and output
External I/O Terminals	Alarm In, Alarm Out

MECHANICAL	DIRECT SURFACE MOUNT	SURFACE MOUNT WITH JUNCTION BOX	PENDANT MOUNT WITH NPT ADAPTER	PENDANT MOUNT WITH NPT + WALL MOUNT
Dimensions (LxWxH)	218 mm x 118 mm x 82 mm; 8.6″ x 4.6″ x 3.2″	237 mm x 136 mm x 120 mm; 9.3″ x 5.4″ x 4.7″	230 mm x 129 mm x 146 mm; 9.0″ x 5.0″ x 5.8″	230 mm x 260 mm x 195 mm; 9.0″ x 10.2″ x 7.7″
Weight	1.25 kg (2.75 lbs)	2.33 kg (5.13 lbs)	1.67 kg (3.67 lbs)	3.07 kg (6.75 lbs)
Body	Aluminum			
Finish	Cast, powder coated, close to RAL9002			
Adjustment Range	Pan: 180°, Azimuth: 360°, Tilt: 30° – 95° tilt (recommended), 10° – 95° tilt (maximum)			

ELECTRICAL	
Power Consumption	13 W max
Power Source	PoE: IEEE802.3af Class 3 compliant
RTC Backup Battery	3V manganese lithium
Memory	2 GB RAM, 512 MB Flash

ENVIRONMENTAL	
Operating Temperature	-30 °C to +60 °C (-22 °F to 140 °F), in enclosed space -30 °C to +65 °C (-22 °F to 149 °F), with ambient convection Cold start delay of up to 10 min at -30 °C (-22 °F). Camera may restart during startup delay
IR Illuminator Behavior	IR illuminator will turn off if the temperature is 55 °C (131 °F) or higher. The illuminator will operate at 50% power if the temperature is between 45 °C (113 °F) and 54 °C (129 °F). The illuminator will operate at 50% power if the temperature is below -25 °C (-13 °F), with ambient convection.
Storage Temperature	-10 °C to +70 °C (14 °F to 158 °F)
Humidity	0 - 95% non-condensing

CERTIFICATIONS	
Certifications/Directives	UL, cUL, CE, UKCA, ROHS, REACH, RCM, KC, EAC, BIS, NOM
Safety	UL 62368-1, CSA 62368-1, IEC/EN 62368-1, IEC 62471
Environmental	UL/CSA/IEC 60950-22, IEC 62262 IK10 Impact Rating IEC 60529 IP66 and IP67 Weather Rating (H5DH-DO1-IR models only)
Electromagnetic Emissions	FCC Part 15 Subpart B Class B, IC ICES-003 Class B, EN 55032 Class B, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN 50121-4
Electromagnetic Immunity	EN 55035, EN 61000-6-1, EN 50130-4, EN 50121-4

ANALYTICS SPECIFICATIONS

SUPPORTED ANALYTICS EVENTS	
Objects in Area	The event is triggered when the selected object type moves into the region of interest.
Object Loitering	The event is triggered when the selected object type moves into the region of interest and then stays for an extended amount of time.
Objects Crossing Beam	The event is triggered when the specified number of objects have crossed the directional beam that is configured over the camera's field of view. The beam can be unidirectional or bidirectional.
Object Appears or Enters Area	The event is triggered by each object that enters the region of interest. This event can be used to count objects.
Object Not Present in Area	The event is triggered when no objects are present in the region of interest.
Objects Enter Area	The event is triggered when the specified number of objects have entered the region of interest.
Objects Leave Area	The event is triggered when the specified number of objects have left the region of interest.
Object Stops in Area	The event is triggered when an object moves into a region of interest and then stops moving for the specified threshold time.
Direction Violated	The event is triggered when an object moves in the prohibited direction of travel.
Tamper Detection	The event is triggered when the scene unexpectedly changes.

SUPPORTED CLASSIFIED OBJECT TYPES	
Object Types in Outdoor Mode	Vehicle, sub-types: Car, Truck, Bicycle, Motorcycle, Bus Person
Object Types in Indoor Mode	Person

TEACH BY EXAMPLE	
Teach By Example	Yes, when used with Avigilon Control Center™

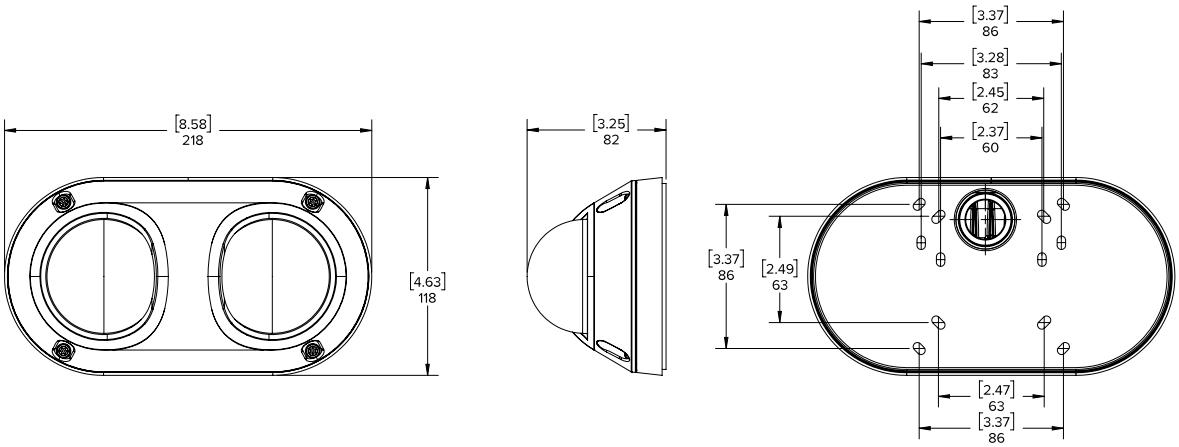
AVIGILON CONTROL CENTER (ACC) VERSIONS SUPPORTED FEATURES	
ACC Version 6.14.12 or higher	All supported analytic events with two types of classified objects: person or vehicle. Appearance search when paired with appropriate server hardware. H.265 supported.
ACC Version 7.2 or higher	All supported analytic events with people and vehicles and all vehicle sub-types as classified objects. Appearance search when paired with appropriate server hardware. H.265 supported.

OUTLINE DIMENSIONS

DUAL HEAD SURFACE MOUNT CAMERA

(H5DH-D1-IR/H5DH-DO1-IR)

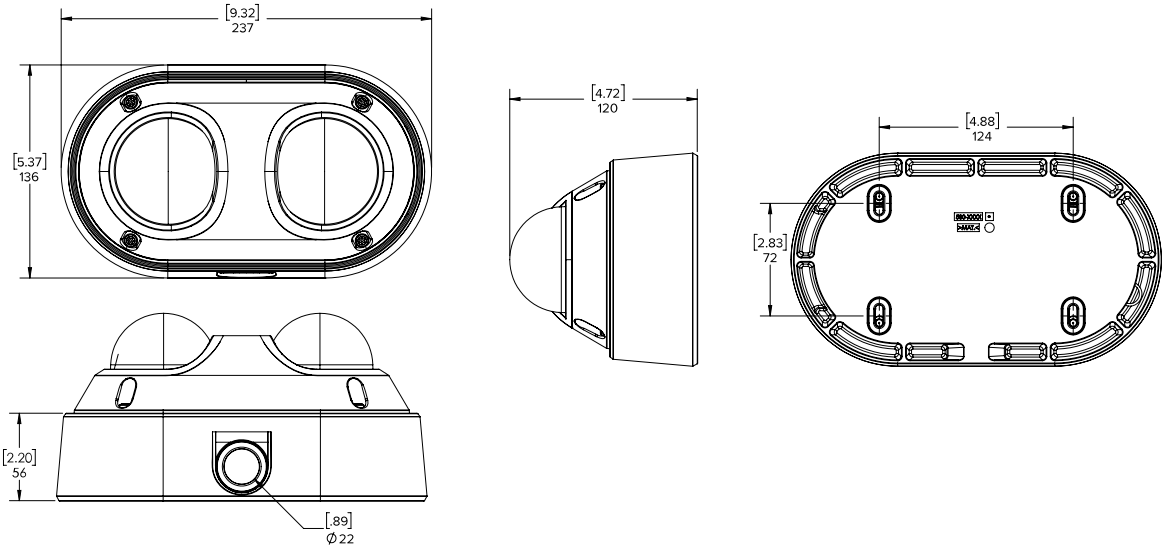
[X.X]	INCHES
X	MM



DUAL HEAD JUNCTION BOX MOUNT CAMERA

(H5DH-D1-IR/H5DH-DO1-IR WITH H5DH-DO-JBOX1 JUNCTION BOX)

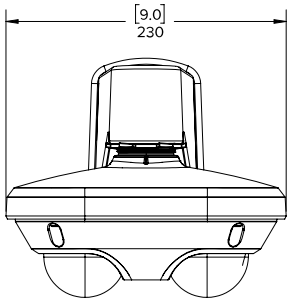
[X.X]	INCHES
X	MM

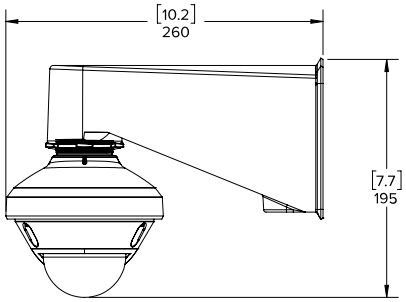


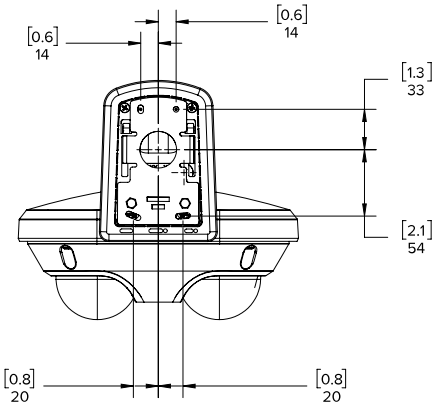
DUAL HEAD PENDANT MOUNT CAMERA

(H5DH-D1-IR/H5DH-DO1-IR WITH H5DH-MT-NPTA1 ADAPTER AND CM-MT-WALL1 WALL ARM)

[X.X]	INCHES
X	MM







ORDERING INFORMATION

	MP	WDR	ANALYTICS	LENS	IP66/IP67	IR LEDS
6.0C-H5DH-D1-IR (Discontinued)	2 × 3.0	✓	✓	3.35 - 7.0 mm		✓
6.0C-H5DH-DO1-IR	2 × 3.0	✓	✓	3.35 - 7.0 mm	✓	✓
10.0C-H5DH-D1-IR (Discontinued)	2 × 5.0	✓	✓	3.35 - 7.0 mm		✓
10.0C-H5DH-DO1-IR	2 × 5.0	✓	✓	3.35 - 7.0 mm	✓	✓

H5DH-DO-CLER1	Replacement outdoor dome cover
H5DH-DI-CLER1	Replacement indoor dome cover
H5DH-DO-JBOX1	Optional junction box mounting adapter
H5DH-MT-NPTA1	Optional pendant NPT mounting adapter
CM-MT-WALL1	Pendant wall mount arm
PLMT-1001	Aluminum pole mounting bracket for pendant dome cameras, compatible with CM-MT-WALL1
CRNMT-1001	Aluminum corner mounting bracket for pendant dome cameras, compatible with CM-MT-WALL1

OPTIONAL CAMERA LICENSES AND ACCESSORIES

CAM-FIPS	Camera license to enable FIPS Level 1 cryptographic mode on any H5A camera
CAM-FIPS-CRYPTR-L3	MSI CRYPTR SD with camera license to enable FIPS Level 3 cryptographic mode on H5A cameras[1]

[1] Excludes H5A Explosion-Protected camera line.

SUPPORT

Learn more and find additional documentation at avigilon.com or email sales@avigilon.com for specific product support.

MOTOROLA SOLUTIONS

AVIGILON

Aug 2023 | Rev 11

IP-APX

PoE+ Weather Resistant Constant Directivity IP Horn with Rotating Bell and Wall/Pole Mount

Features

Network Features
- Dynamic or Static IP Address
- IEEE 802.3 10/100Base-T Ethernet
- IEEE 802.1q Tagging
- IEEE 802.3at Compliant

Audio Codec Support
- G.711 u-law / a-law (16 kbit/s)
- G.729 Wideband Audio (64 kbits/s)

Auto Registration
- SLP for Singlewire Applications
- DHCP Option 72 for Syn-Apps / Intrado Applications
- IEDNet+ for AtlasIED Applications

Static Configuration
- HTTP GUI for Static Configuration

Audio Features
- Integrated Amplifier with Secondary 8 output
- Aux Audio Line-In Balanced (2.8Vpp 10K)
- Aux Audio Line-Out Balanced (2.8Vpp 10K)

Additional Features
- 2 General Purpose Inputs
- 1 General Purpose Output (2A @ 30 VDC)
- Phone / Night Loud Ringer
- External Power Supply Option
- Highly Efficient Horn Speaker Provides Greater Output and Coverage

General Description

AtlasIED IP-APX is a weather resistant constant directivity high-output IP horn with rotating bell and wall / pole mount. It compliments the Unified Communications (VoIP Communications) investment including on-premises and hosted infrastructure platforms so that announcements can be pushed to people and spaces beyond the world of desktop telephony communication, breaking any traditional audio-path barriers.

The AtlasIED IP-APX IP Endpoint features a 60˚ x 40˚ constant- dispersion pattern across the controlled frequency band of 1.25-10 kHz. The rotating bell pivots in precise 15˚ increments for exact on-site positioning of projection angles. A triple lock security mounting method saves installation time and provides long-term stability.

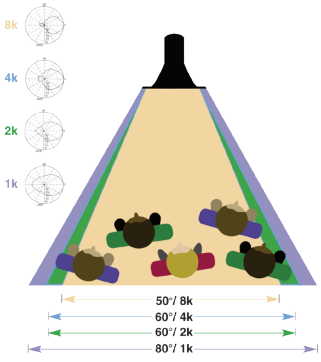
Applications

AtlasIED IP-APX registers as a communication endpoint directly within Singlewire®, AtlasIED®, Syn-Apps® and Intrado® notification applications, supporting audio broadcast to enhance physical security while improving day-to-day communications through advanced alerting, bell schedules and pre-recorded & scheduled announcements, while leveraging the wide area network (WAN) or local area network (LAN) architecture.

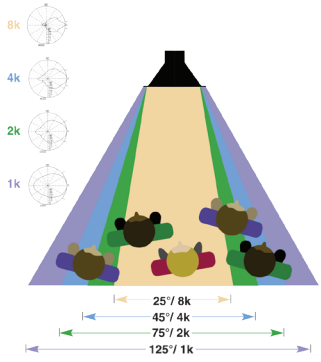
AtlasIED IP-APX supports Call Manager publisher subscriber SIP Service call processing failover. This service provides remote location call-processing redundancy when access to the centralized Call Manager is interrupted because of a WAN outage. In Cisco® UMC environment, IPX endpoints can register to either Cisco's basic or advanced 3rd party SIP device service for paging functionality. IPX must use Cisco's advanced 3rd party SIP device service when registering to a publisher subscriber configuration.

IP-APX endpoint can register as a SIP device directly to a SIP device directly to a SIP server or VoIP Communications Manager for critical alerts and public address applications.

APX Beamwidth
Controlled Coverage
Across a Wide Freq. Range



Conventional Horn Beamwidth
Collapsing Coverage
Across a Wide Freq. Range



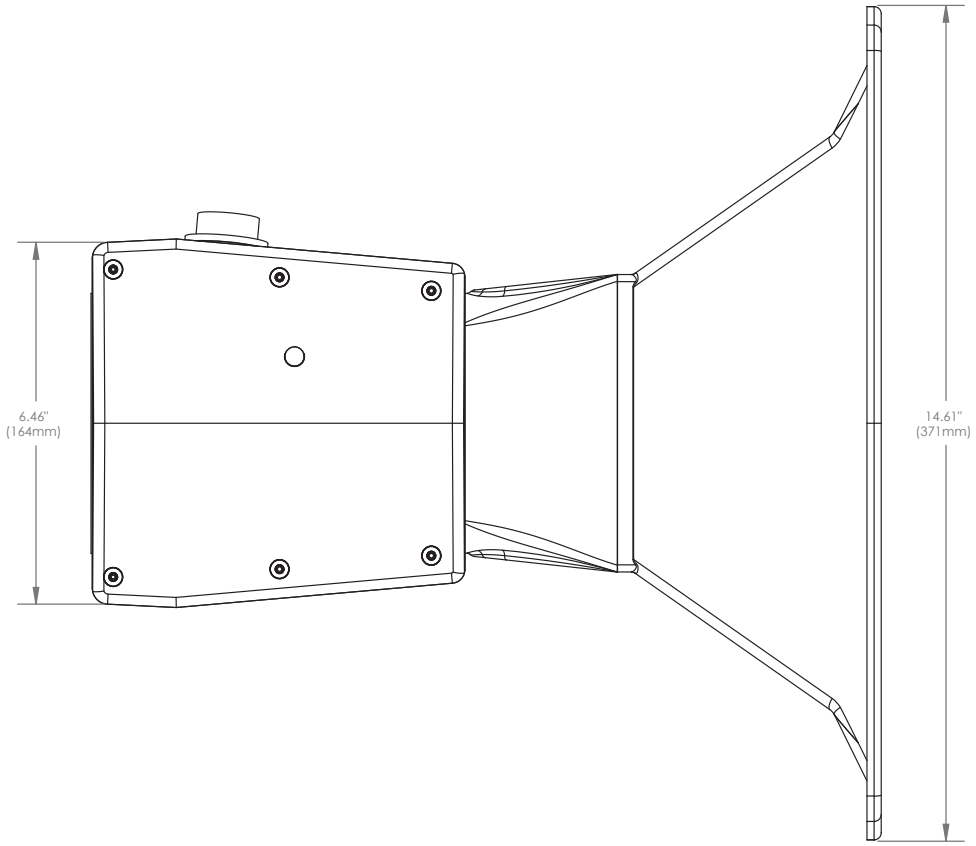
1601 JACK MCKAY BLVD.
ENNIS, TEXAS 75119 U.S.A.
TELEPHONE: (800) 876-3333
SUPPORT@ATLASIED.COM
AtlasIED.com

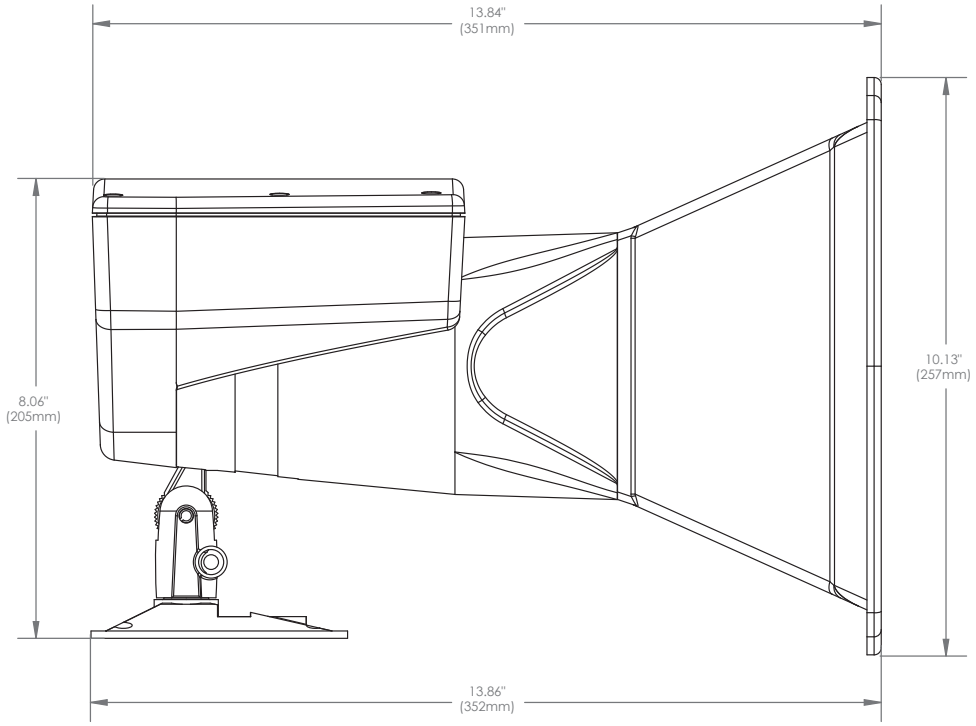
System	
Type	PoE+ Weather Resistant Constant Directivity IP Horn with Rotating Bell and Wall / Pole Mount
Operation Temp	20°C (-4°F) to 70°C (158°F)
Indicators	Network Status (On Control Board)
Frequency Response (+/- 5dB)	400 - 7,500 Hz (Nominal)
Vertical Coverage	40° (-6dB, 2000 Hz Octave Band)
Horizontal Coverage	60° (-6dB, 2000 Hz Octave Band)
Directivity Factor (Q)	26 @ 2 kHz
Max SPL at 1m	121dB at 25 Watts (Peak)
General Purpose Interface	Two Trigger Inputs / One Relay Output (2A @ 30 VDC)
Transducers	
LF Transducer Qty and Size	N/A
HF Transducer Qty and Size	(1) 14.62" (371.35mm) X 10.13" (257.3mm) Bell with Double Entrant Compression Driver
HF Crossover Frequency	400 Hz
Voice Coil Size	1.25" (32mm)
Cone Material	High-Impact, Neutral- Grey Polycarbonate Resin with UV Light Inhibitor
Sensitivity	107dB at 1 Watt / 1 Meter Average
Amplification	
Type	Single-Channel Class D Topology with Primary and Secondary Outputs
AC Power Input	PoE+ and External 24VDC
Power Rating (RMS)	25 Watts Max (802.3at)
THD	<0.2%
Cooling	Passive / Convection
Driver Protection	Built-In Limiter and HP Filter
Audio Inputs and Outputs	
Input: Analog Audio Type(s)	One Balanced Line Level
Input: Analog Connectivity	Secured Screw Terminal Block
Input: Network Audio Type(s)	G.711 U-Law / A-Law and G.722 Capable
Input: Network Connectivity	RJ-45 female
Output: Analog Audio Type(s)	One Balanced Line Level
Output: Analog Connectivity	Secured Screw Terminal Block
Output: Digital Audio Type(s)	G.711 U-Law / A-Law and G.722 Capable (Multicast)
Output: Digital Connectivity	N/A
Output: Speaker Level	8 , 25W (802.3at)
Output: Speaker Connectivity	Primary and Slave Secured Screw Terminal Block
Software	
AtlasIED GCK Compatible Version	7.0+
InformaCast Advanced Compatible Version	4.0+
InformaCast Fusion Compatible Version	3.0+
Syn-Apps SA-Announce Compatible Versions	9.0.18+
Intrado Revolution Compatible Versions	V2017.3.1+
Network	
Ethernet	IEEE 802.3 10/100Base-T
POE	IEEE 802.3at Compliant
VLAN	IEEE 802.1q Tagging

Protocols	
IP Addressing	DHCP / Static
LLDP-MED	PoE Power Negotiation
Auto-Registration	HTTP / Service Location Protocol / IEDNet+ / DHCP Option 72
Time	NTP or Host Server
Telephony	SIP
Enclosure	
Color	Pantone Warm Gray 3 C - RAL 7044
Grille Material	N/A
Baffle Material	N/A
Mounting / Rigging Provisions	Sturdy Die-Cast Base May Be Mounted to 1-gang, 2-gang, and 4" Square E.O. or Band to Pole
Safety Agency Ratings	ETL Listed to Comply with 62368-1, CSA C22.2 #62368-1, IEC 62368-1 CB Scheme and FCC
Ingress Protection	IP-56
Logo	Blue
Product Dimensions (HxWxD)	8.02" x 14.61" x 13.86" (204mm x 371mm x 352mm)
Shipping Dimensions (HxWxD)	14.25" x 14.875" x10.32" (362mm x 377.8 mm x 262.1mm)
Net Weight - lbs	6.45 lbs (2.92 kg)
Shipping Weight - lbs	7.75 lbs (3.51kg)
Warranty Coverage	
Warranty Period	1 Year

NOTES:
1. Sensitivity: Half space pink noise measurement at 6ft (1.8 m) at 20% power; extrapolated to 1 meter and an input of 2.83 volts RMS.
2. Watts: All wattage figures are caluclated using the rated nominal impedance.
3. Frequency response and sensitivity are half-space measurements.

Dimensional Drawings





Architect and Engineer Specifications

The unit shall be AtlasIED model IP-APX. The PoE+ weather resistant constant directivity IP Horn with rotating bell system shall include factory assembled rotating bell, IP addressable PCB amplifier / control, sturdy die-cast base and an IP56 rating.

The weather resistant constant directivity IP Horn with rotating bell system shall have an overall frequency response of 400-7,500 Hz (nominal), 500-5000 Hz (± 5dB). Sound pressure level shall be 107dB at 1 Watt / 1 meter, and max peak output at 1m shall be 121dB SPL. The impedance shall be 8 ohm and a voice coil diameter of 1.25" (32mm).

The horn's rotating bell shall provide a 60° x 40° constant-dispersion pattern across the controlled frequency band of 1.25-10 kHz. The rotating bell shall include pivots in precise 15° increments for exact on-site positioning of projection angles.

The amplifier / control board shall incorporate conformal coating to protect against moisture, dust, chemicals, and temperature extremes. It shall include a single-channel class D topology amplifier with primary and secondary outputs capable of producing 25-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply. The secondary output shall share the same factory EQ and crossover settings as the primary output to support an optional passive speaker of the same type. Interconnect shall be via female water-resistant RJ-45 connector mounted to the side of the enclosure.

The amplifier/control board shall include (2) logic inputs, (1) relay output, (1) auxiliary balanced line level audio input and (1) balanced line level audio output. The auxiliary line level input shall include an auto mute function that is activated when a broadcast is sensed from the control application.

The amplifier/control board shall receive announcements and messages using dynamically routed data on a standard Ethernet network. It shall include a Graphical User Interface (GUI) for SIP configuration. The SIP implementation shall support standards G.711, G.722 and RTP protocols. The GUI shall configure and manage logic inputs, relay outputs, and auxiliary audio input.

All control functionalities shall be determined via software. It shall be compatible with AtlasIED's Discovery Tool, AtlasIED's GCK, Syn-Apps' SA-Announce or Intrado's Revolution, Singlewire's InformaCast software platforms and SIP standalone.

The PoE+ weather resistant constant directivity IP Horn with rotating bell system shall be Molded of High-Impact, Neutral- Grey Polycarbonate Resin with UV Light Inhibitor Preventing Embrittlement or Discoloration and shall incorporate a Sturdy Die-Cast Base that may be mounted to 1-gang, 2-gang, and 4" Square E.O. or Band to Pole. The overall dimensions shall be H 8" x W 14 5/8" x D 13 7/8".

ADVANCED NETWORK DEVICES

IPSIGNL-RWB

Large IP Display

Overview

Notify large audiences in auditoriums, cafeterias, or multi-purposes spaces with the PoE Large IP Display. Display alerts, countdown timers, and announcements on the large 33”x5” display using multi-colored text, LED flashers, and two 8 inch speakers to be seen and heard throughout the large space.

The IPSIGNL-RWB easily integrates with VoIP phone systems, approved 3rd party software, and includes ClockWise Campus software with purchase.

Description

DISPLAY

Multi-color LED scrolling text and pixel graphics. 1-line or 2-line display.

MICROPHONE

Hands-free two-way intercom.

FLASHER

One red, one white, one blue LED flasher. Individually controlled.

AUDIO

Two 8” high-efficiency speakers. Audio coverage up to 600ft^2.

PERIPHERAL INTEGRATION

Connect a strobe, motion sensor, electronic lock, call button, etc.

SOFTWARE

ClockWise Campus software included. Compatible with approved third-party software.

SIP INTEGRATION

SIP-enabled. Easily interfaces with VoIP / SIP phone systems.

LIGHT SENSOR

Auto-dimming display.

Solutions

- Paging
- Intercom
- Bell scheduling
- Code alerts
- Emergency notification
- Access control
- Security monitoring
- Music streaming

Additional Features

- Built-in web server
- Full multicast and broadcast support
- Requires Cat5 or Cat6 cable
- Back enclosure is included
- Atomic time

Compatible Peripherals

Peripheral Interface Adapter

- AND-PIA-2D - required for connection to Strobe Kit or Call Button Kit

Strobe Kit

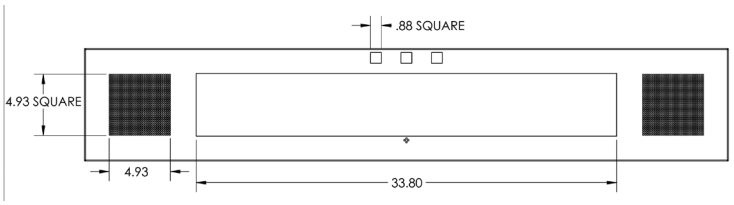
- AND-STROBE-KIT-1

AND Button Kit

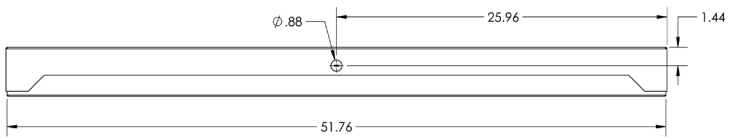
- AND-BTN-KIT-1

Dimensions

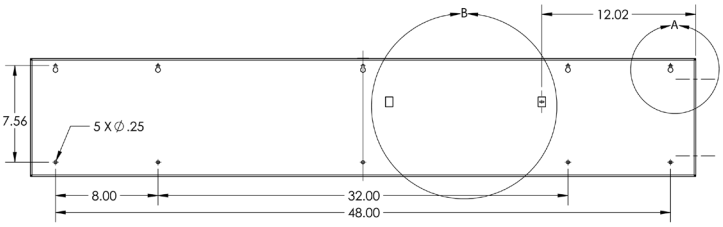
(Dimensions are subject to change)



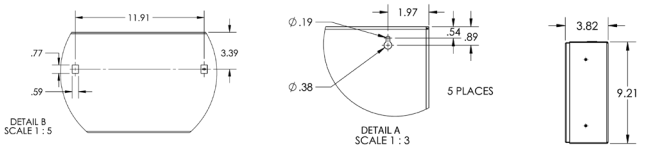
Front



Top



Back



Back Detailed

Side

Specifications

Due to continual product development, specifications are subject to change without notice.

Power Input	PoE (IEEE802.3af) 15.4 W or PoE+ (IEEE802.3at) 30.0 W (recommended)
Ethernet I/F	10/100 Mbps
Speaker Size	8”
Audio Power	8 W / 16 W
Frequency Response	60 Hz - 17 kHz
Audio Payload Types	G711, A-law and μ-law
Average Sensitivity	95dB, 1W / 1 M
Supported Protocols	SIP, IPv4, IPv6, 802.1X, HTTP, SLP, TFTP, NTP, SNMPV1 & SNMPV2c, DHCP, IGMP, ICMP, TCP/IP, LLDP-MED, UDP, MDNS & MDNS-SD
General Purpose Interface	2 GPI via AND-PIA-2D 1 GPO: Contact Closure or 12 VDC / 15 VDC via AND-PIA-2D
Audio Interface	Analog Line Out via AND-PIA-2D Analog Line In via AND-PIA-2D
Operating Temperature	14˚ TO 122˚ F (-10˚ TO 50˚ C)
Dimensions	51.76” W x 9.21” H x 3.82 D
Weight	26 lbs (11.8 kg)
Warranty	2 Year Limited

Advanced Network Devices | 3820 N. Ventura Dr. Arlington Hts. IL 60004
847-463-2236 | sales@anetd.com | www.anetd.com

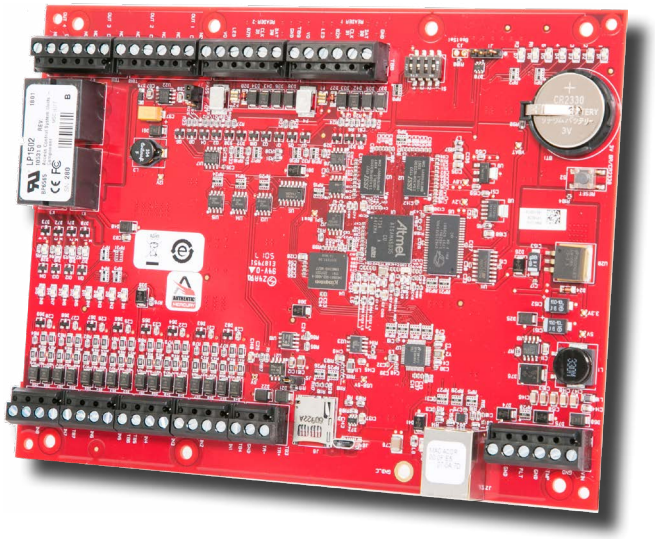
Model: IPSIGNL-RWB
Advanced Network Devices
www.anetd.com

Conforms to UL STD 60950-1
Cert. to CAN/CSA STD C22.2 #60950-1
Tested to IEC 62471
42.5V-57.0V DC, 25.5 W Max
802.3at PoE+

avigilon™
a Motorola Solutions Company

LP Series - AC-MER-CONT-LP1502 Intelligent Controller

The Avigilon Access Control Manager (ACM) system supports open field hardware from Mercury Security allowing organizations to leverage investments in non-proprietary field hardware, with retrofit programs available for industry standard multi-device interface panels, power and communication controller boards, and intelligent controllers. The new Authentic Mercury LP Series Intelligent Controllers are Mercury Security's enhanced platform that offers an improved processor and increased memory, plus feature an embedded crypto memory chip that provides a secured layer of encryption to onboard sensitive data. The multi-port AC-MER-CONT-LP1502 is a dual card reader panel for controlling two connected doors and managing up to 64 doors/openings.



With native connectivity, the high-performance AC-MER-CONT- LP1502 functions independently of the host for performing numerous access control applications and supports OSDP, OSDP Secure Channel, keypads, biometric readers, Wiegand, clock and data, magnetic stripe, F/2F and supervised F/2F reader technologies.

KEY FEATURES

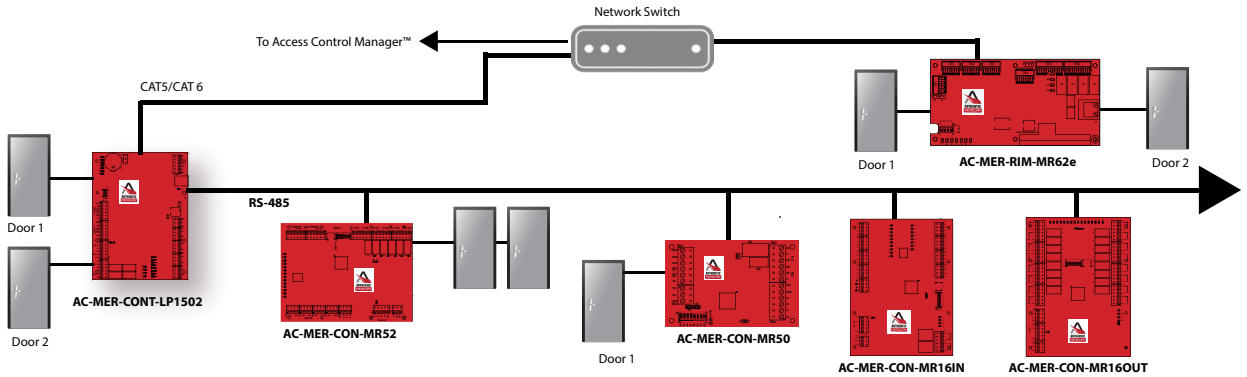
- Enhanced Security: Embedded crypto memory chip and data at rest encryption provides secured layer of protection of sensitive data
- OSDP Protocol: Secure channel communications for reader connectivity
- Host communications protected by TLS 1.2/1.1
- Controller/IO Expansion connection protected by AES (Series 3 SIO)
- Port based network access control using 802.1X
- FIPS 140-2 user of OpenSSL
- Supports multiple card formats, paired and alternate readers, elevator, turnstile and biometric devices
- Anti-passback support (area, reader and time based), programmable keypad user commands, threat level and operating modes

AUTHENTIC MERCURY

Platinum Elite MERCURY

Specifications

TECHNICAL SPECIFICATIONS	Access Control	189,486 cardholder capacity 50,000 transaction buffer Supports total of 1 RS-485 IO protocol 16 access levels per cardholder Cardholder - 19 Digit (64 Bit) User ID with 8 digit PIN MAX Activation/Deactivation	If/Then macro capabilities Anti-passback support Nested, area, hard, soft and timed forgiveness Adjustable cardholder capacity Supports up to 504 inputs or 500 outputs
	Door Control	Natively supports for up to 4 readers and 2 openings. Expands to support up to 64 readers and openings	
	Primary Power	12 to 24 Vdc ± 10 %, 500 mA maximum (reader and USB ports not included)	
	Reader Port	600 mA maximum (add 600 mA to primary power current)	
	Micro USB Port	5 Vdc, 500 mA maximum (add 270 mA to primary power current)	
	Battery	Memory/ Clock Backup: 3 Volt Lithium, type BR2330 or CR2330	
	microSD Card	microSD or microSDHC; 2GB to 8GB	
	Host Comm.	Ethernet: 10-BaseT/100Base-TX and USB port (2.0) with optional adapter: pluggable model USB2-OTGE100	
	Serial I/O Device	2-wire RS-485, 2,400 to 115,200 bps, asynchronous, halfduplex, 1 start bit, 8 data bits, and 1 stop bit	
	Inputs	Eight unsupervised/supervised, standard EOL: 1k/1k ohm, 1%, ¼ watt. Two unsupervised dedicated for cabinet tamper and UPS fault monitoring	
	Output Relays	Four relays, Form C, NO 5 A @ 30 Vdc resistive, NC 3 A @ 30 Vdc resistive	
READER INTERFACE	Reader Power	12-24 Vdc ± 10 % regulated, 300 mA maximum each reader	
	Data Inputs	TTL compatible, F/2F or 2-wire RS-485	
	RS-485 Mode	9,600 to 115,200 bps, asynchronous, half-duplex, 1 start bit, 8 data bits, and 1 stop bit. Maximum cable length: 2000 ft. (609.6 m)	
	LED Output	TTL levels, high>3 V, low<0.5 V, 5 mA source/sink maximum	
	Buzzer Output	Open collector, 12 Vdc open circuit maximum, 40 mA sink maximum	
CABLE REQUIREMENTS	Power and Relays	1 twisted pair, 18 to 16 AWG	
	Ethernet	CAT-5, minimum	
	Reader TTL	6-conductor, 18 AWG, 500 feet (150 m) maximum	
	Reader F/2F	4-conductor, 18 AWG, 500 feet (150 m) maximum	
	Reader RS-485	1 twisted pair, shielded, 120 ohm impedance, 24 AWG, 2,000 ft. (610 m) max.	
	I/O Devices	1 twisted pair with drain wire and shield, 120 ohm impedance, 24 AWG, 4,000 ft. (1,219 m) maximum	
	Alarm Input	1 twisted pair, 30 ohms maximum	
ENVIRONMENTAL	Temperature	-55 to 85 °C storage, 0 to 70 °C, operating	
	Humidity	5 to 95% RHNC	
MECHANICAL	Dimensions	8 in. (203.2 mm) W x 6 in. (152.4 mm) L x 1 in. (25 mm) H	
	Weight	9 oz. (255 g) nominal, board only	
COMPLIANCE	Product Compliance	UL294 Recognized, FCC Part 15 Class A, CE Compliant, RoHS, NIST Certified Encryption	



ORDERING INFORMATION	AC-MER-CONT-LP1502	LP Series - AC-MER-CONT-LP1502 - Intelligent Controller

SmartCommand System
3400 BOSS

3400 BOSS

RATH by AVIRE

Part #: 3400 (96 Zone)

The BOSS is the "Brains" of SmartCommand System. The BOSS powers the Call Commander and Call Boxes.

CODE COMPLIANCE:

- International Building Code (IBC)
- National Fire Protection Association (NFPA)
- Americans Disabilities Act (ADA)

Specifications:

Dimensions: 3.35" H x 17.2" W x 12.3" D

Environmental: 23° F – 131° F

Mounting: Surface, Wall, or Rack Mount

Warranty: 2 Years

POWER REQUIREMENTS:

- 120vac backed up power
- Single dedicated phone line
- Provides power to Call Commander and all Call Boxes (supports up to 96 Call Boxes)

WIRING REQUIREMENTS:

- Call Commander to BOSS: Two pair
- BOSS Daisy Chain Run: Minimum two pair

PROGRAMMING FEATURES:

- Requires a laptop to program (USB type B cable included)
- Program up to two outbound emergency phone numbers at the BOSS

ADDITIONAL FEATURES:

- Built-in supervision of communication connections
- Software allows for Call Box setup including text to speech location messages and building address
- System fault and Call Box activation relay outputs

SmartCommand System 3300FSCN Call Box

3300FSCN

Part #: 3300FSCN

Call Boxes provide distressed parties a means to communicate with rescue personnel during an emergency. The system Call Boxes can be daisy chained for a quick and efficient installation.

CODE COMPLIANCE:

- International Building Code (IBC)
- National Fire Protection Association (NFPA)
- Americans Disabilities Act (ADA)

POWER REQUIREMENTS:

- Powered from the BOSS and requires two pairs from the BOSS

WIRING REQUIREMENTS:

- Daisy chained connection between Call Boxes

PROGRAMMING FEATURES:

- Text to speech message programming via BOSS Head End

PHONE CAPABILITIES:

- LED indicators for power and call status

Specifications:

Dimensions: Call Box: 8.66” H x 5.12” W x 0.48” D

Cover: 7.83” H x 5.01” W x 0.59” D

Environmental: -13° F – 131° F

Mounting: Flush Mount, RP7700504 Back Box Required (7.75” H x 3.77” W x 2.63” D)

Design: Stainless Steel with Cover

Warranty: 2 Years