SPECIFICATIONS FOR

BREWSTER CENTRAL SCHOOL DISTRICT
SECURITY VESTIBULE, SYNTHETIC FIELDS & RELATED WORK AT
BREWSTER HIGH SCHOOL

SED PROJECT NO.: 48 06 01 06 0 004 018 Brewster High School:

F&D PROJECT NO.: 23505.01

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

PROJECT NAME: **SECURITY VESTIBULE, SYNTHETIC FIELDS & RELATED WORK**
Brewster High School

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

MECHANICAL:

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

SITE:

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

ENVIRONMENTAL:

ENVIROSCIENCE CONSULTANTS
37 Moore Avenue
Mt. Kisco, NY 10549

STRUCTURAL:

GMCE P.C.
34 Shadblow Hill Rd,
Ridgefield, CT 06877

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: 4/23/2024 **BID**

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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)

END OF SECTION

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
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E. Bid Enclosures/Requirements
   1. Security Deposit
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   5. Bid Form Signature
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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 - HVAC Contractor

E. Section 00 4130 - Bid Form - Electrical Contractor

F. Section 00 4140 - Bid Form - Site Contractor

G. Section 00 4150 - Bid Form - Elevator Contractor

H. Section 00 4401 - Qualification of Bidders.

I. Section 00 4402 - Hold Harmless Agreement

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

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

L. Section 00 4476 - Insurance Certification.

M. Section 00 5200 - Form of Agreement.

N. Section 00 6000 - Bonds and Certificates.

O. Section 00 7200 - General Conditions.

P. Section 01 2100 - Allowances.

Q. Section 01 2300 - Alternates .

R. Section 01 5000 - Temporary Facilities and Controls.

S. Section 01 7000 - Execution.

T. 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, NY 10509 before 11:00 AM local time on the 16 th day of May, 2024.

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 BHS Security Vestibule, Synthetic Fields & Related Work located at the Brewster High School for a Stipulated Sum, in accordance with the Contract Documents.

1.6 LUMP SUM BIDS

A. Bids will be received for six (6) separate Prime Contracts as follows:

1. Construction .
2. Plumbing .
3. HVAC .
4. Electrical .
5. Site.
6. Elevator

1.7 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

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

B. Project Location:

50 Foggintown 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.

1.11 EXAMINATION

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

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

C. 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 Construction Manager 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 .

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 9:00 AM on May 1, 2024. Bidders shall meet at the May 1, 2024 of the Brewster High School.

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

C. 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: **BHS Security Vestibule, Synthetic Fields & Related Work**
NAME OF OWNER: **Brewster Central School District**
FACILITY: **Brewster High School**
DATE: **_____**
A/E PROJECT NO: **23505.01**
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 1.12 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 CONSTRUCTION CONTRACTOR

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District

30 Farm To Market Road:

Brewster, NY 10509

FOR:

BHS Security Vestibule, Synthetic Fields & Related Work

50 Foggintown Road

A. Architects Project Number: 23505.01

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

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 Architectfor the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Construction Work at for the Sum of:

1. BASE BID
   a. The Contractor for Construction Base Bid to provide, furnish and install all labor, equipment and material required to provide all construction for Security Vestibule, Synthetic Field and related work at the Brewster High School in accordance with the specifications and as shown on the contract drawings for Construction is as follows:

   _____($_____) DOLLARS
2. CONTINGENCY ALLOWANCES - GC
   a. The total Contingency Allowances as indicated in Section 01 2100 is as follows:

   _____ ($_____DOLLARS

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

B. **TOTAL BASE BID (INCLUDING ALL GC ALLOWANCES)**

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No.1 General Construction and Related Work work is as follows:

_____ $_____), DOLLARS

C. 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 Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

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

E. We have included the required performance and payment bonds costs in the Bid Amount as required by the Instructions to Bidders.

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

1.2 ALTERNATES

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

1. Alternate GC-1 - Construction Contractor:

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 rebuild the existing bridge abutments] [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 ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
2. Furnish the required Performance and Payment bonds within ten(10) days of receipt of Notice of Award or with the executed Contract.

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.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

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 AIA 201-2017 General Conditions of the Contract.

1.6 CHANGES TO THE WORK

A. Refer to AIA 201-2017 General Conditions of the Contract Article 7.

B. When Owner's Representative establishes that the method of valuation for Changes in the Work will be a fixed fee shall be in accordance with 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 _____.

1.8 BID FORM SUPPLEMENTS

A. The following is included with Bid submission:
   1. Refer to Section 00 4301 - Bid Form Supplements.

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 his/her 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 Brewster Central 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)

_____

(Authorized signing officer, Title)

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____ 202_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4110
BID FORM - PLUMBING CONTRACTOR

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District
30 Farm To Market Road
Brewster, NY 10509

FOR:

BHS Security Vestibule, Synthetic Fields & Related Work at:
Brewster High School
50 Foggintown Road
Brewster, NY 10509

Project Number: 23505.01

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 Brewster High School for the Sum of:

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

      _____
      _____($_____) DOLLARS

   b. **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 Brewster High 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.

1.2 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 seven 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.

1.3 REJECTION OF BIDS

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

1.4 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.

1.5 CHANGES TO THE WORK

A. Refer to General Conditions.

1.6 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 _____.

1.7 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 00 4401 - Qualification 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.
   7. Section 01 2100 - Allowances: Itemized contingency allowance list.

1.8 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.

1.9 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.

1.10 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 - HVAC CONTRACTOR

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District

30 Farm To Market Road

Brewster, NY 10509

FOR:

BHS Security Vestibule, Synthetic Fields & Related Work at:

Brewster High School

50 Foggintown Road:

Brewster, NY 10509

Project Number: 23505.01

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 Brewster High School for the Sum of:

1. BASE BID FOR Brewster High 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 ALLOWANCES - HVAC
   a. The Total Commissioning Allowance for HVAC as indicated in Section 01 2100 is as follows:

      _____($_____)DOLLARS

3. **Note: Attach Section 01 2100 - Allowances, itemized list to bid proposal**.
   a. **TOTAL BASE BID (Include Allowance)**
      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 Brewster High 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 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 seven 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.

1.3 REJECTION OF BIDS

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

1.4 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.

1.5 CHANGES TO THE WORK

A. Refer to General Conditions.

1.6 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 _____.

1.7 BID FORM SUPPLEMENTS

A. The following information is included with bid submission:

1. Refer to Section 00 4301 Bid Form Supplement Cover Sheet

1.8 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.

1.9 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.

1.10 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 - ELECTRICAL CONTRACTOR

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District
30 Farm To Market Road
Brewster, NY 10509

FOR:

BHS Security Vestibule, Synthetic Fields & Related Work at:
Brewster High School
50 Foggintown Road:
Brewster, NY 10509
Project Number: 23505.01

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 Brewster High School for the Sum of:

1. BASE BID FOR Brewster High 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 Brewster High 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 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 seven 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.

1.3 REJECTION OF BIDS

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

1.4 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.

1.5 CHANGES TO THE WORK

A. Refer to General Conditions.

1.6 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 _____.

1.7 BID FORM SUPPLEMENTS

A. The following information is included with bid submission:
   1. Refer to Section 00 4301 - Bid Form Supplement Cover Sheet

1.8 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.

1.9 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.

1.10 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 4140
BID FORM - SITE CONTRACTOR

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District

30 Farm To Market Road

Brewster, NY 10509

FOR:

BHS Security Vestibule, Synthetic Field & Related Work

50 Foggintown Road:

Brewster, New York 10509

Project Number: 23505.01

DATE: _____ (Bidder to enter date)

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

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 #5 Site Work for the new Track, Fields, Parking, all related removals, sitework and infrastructure for the Sum of:

1.

a. BASE BID

a) The Base Bid of this Proposal for all work required by the Contract Documents for Contract # 5 Site:

_____
_____($_____) DOLLARS

b. TOTAL CONTINGENCY ALLOWANCES - SC

c. **(Attach Section 01 2100 - Allowances itemized contingency list to bid proposal.)**

a) The Total SC Allowances as indicated in Section 01 2100 is as follows:

_____
_____($_____) DOLLARS

d. **TOTAL BASE BID (INCLUDE ALL SC ALLOWANCES)**

a) The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #5 Site Work 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.

1. Alternate No. S-1 :
   a. The Contractor for Contract # 5 Site 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 new Site work related to the construction of the New Parking Lot C at Foggintown Road in accordance with the specifications and the contract drawings.

   _____
   _____($_____), DOLLARS.

2. Alternate No.-S-2
   a. The Contractor for Contract #5 Site work shall state the amount to be ADDED TO the Base Bid to construct a concrete pad for the relocated Bleachers at Field #8 in accordance with the specifications and the contract drawings..

   _____
   _____($_____), DOLLARS.

3. Alternate No. -S-3
   a. The Contractor for Contract #5 Site work shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all labor, equipment and material required to remove existing asphalt pad and sub base and to restore area in accordance with the specifications and contract drawings.

   _____
   _____($_____), DOLLARS.

4. Alternate No. SC- 4
   a. The Contractor for Contract #5 - Site work shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all work related to new asphalt paving as indicated on the 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 seven 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.

D. Alternates include all labor, materials and equipment required to furnish and install the Alternates as listed and all the Alternates shall be constructed in accordance with the drawings and specifications.

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 _____.

1.8 BID FORM SUPPLEMENTS

A. The following information is included with bid submission:

1. Refer to Section 00 4301 - Bid Form Supplements Cover Sheet.

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 4150
BID FORM - ELEVATOR CONTRACTOR

THE PROJECT AND THE PARTIES

TO:

Brewster Central School District

30 Farm To Market Road

Brewster, NY 10509

FOR:

BHS Security Vestibule, Synthetic Field & Related Work

50 Foggintown Road:

Brewster, New York 10509

Project Number: 23505.01

DATE: _____ (Bidder to enter date)

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

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 #6 Elevator Modification Work at BHS for the Sum of:

1.

a. BASE BID

a) The Base Bid of this Proposal for all work required by the Contract Documents for Contract #6 Elevator:

_____
_____($_____) DOLLARS

b. **TOTAL BASE BID**

a) The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #6 Elevator at BHS and Related Work is as follows:

_____
_____ $_____), DOLLARS

(The Total Base Bid is the sum of 1.2.a.a and 1.2 b.a)

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. EL - 1:

1. The Contractor shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all labor, equipment and material required to [provide Service Contract in accordance with specifications and shown on drawings.] Work shall include all associated electrical installations.

_____
_____($_____), 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 seven 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 _____.

1.8 BID FORM SUPPLEMENTS

A. The following information is included with bid submission:

1. Refer to Section 00 4301 - Bid Form Supplements Cover Sheet.

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 4301
BID FORM SUPPLEMENTS

PARTICULARS

TO: Brewster Central School District

ARCHITECTS PROJECT NUMBER: 23505.01

PROJECT DESCRIPTION: BHS Security Vestibule, Synthetic Fields & 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. Section 00 6000 - Bonds and Certificates
B. Section 00 4401 - Qualification of Bidders.
C. Section 00 4402 - Hold Harmless Agreement.
D. Section 00 4460 - Certification of Compliance With the Iran Disinvestment Act OR
E. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act.
F. Section 00 4476 - Insurance Certification.
G. Section 01 2100 - Allowances.
H. 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 financial responsibility, 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. The bidder is not currently involved in bankruptcy proceedings.

F. The bidder is capable of and intends 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 seventy-five (75) of the field work by its own employees.
    b. 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.

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

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

I. 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.

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

K. Each Company (Bidder) shall furnish, on the attached form, the three (3) three projects of 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, Architect, and Construction Manager reserves the right to require additional information it deems appropriate concerning the history of the contractor's performance of each such contract.

L. The final determination of whether the contractor possesses the requisite experience rests in the sole discretion of the Owner and Construction Manager.

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, NY 10509

Submitted By: _____

Tele #: _____ E-mail: _____

Corporation _____Partnership _____ Individual_____

Address:_____

Principal Office:_____

Other: _____

Project: BHS Security Vestibule, Synthetic Fields & Related Work

Facility: Brewster High School

Type of Work: (file separate for each Classification of Work)

1. General Construction____, Plumbing____, HVAC____, Electrical____, Site____, and Elevator.

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 any law suits or requested arbitration 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: _____**Phone**_____ **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: _____**Phone**_____ **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: _____Phone_____ E-Mail_____

END OF SECTION

SECTION 00 4460
CERTIFICATION OF COMPLIANCE WITH THE IRAN DISINVESTMENT ACT

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

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

Additionally, Bidder/Contractor is advised that once the Prohibited Entities List is posted on the OGS

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

During the term of the Contract, should the Owner receive information that a Bidder/Contractor is in violation of the above-referenced certification, the Owner will offer the person or entity an opportunity to respond. If the person or entity fails to demonstrate that he/she/it has ceased engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages or declaring the Bidder/Contractor in default. The Owner reserves the right to reject any bid or request for assignment for a Bidder/Contractor that appears on the Prohibited Entities List prior to the award of a contract and to pursue a responsibility review with respect to any Bidder/Contractor that is awarded a contract and subsequently appears on the Prohibited Entities List.

I, _____, being duly sworn, deposes and says that 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___

Notary Public: _____

END OF SECTION

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

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. # 23505.01

NAME OF PROJECT: BHS Security Vestibule, Synthetic Fields & Related Work

Brewster High 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 to:

_____at_____

Name of District staff E-mail address

SECTION 00 5200
FORM OF AGREEMENT

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 FORM OF AGREEMENT

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

B. AIA® Document A101® – 2017 Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum forms the basis of Contract between the Owner and Contractor A draft copy is attached.

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

B. Section 00 7300 - Supplementary Conditions.

C. 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, NY 10509 »
« »

and the Contractor:

« »« »
« »
« »
« »

for the following Project:

«Brewster High School »
«Security Vestibule, New Synthetic Turf Field »
« »

The Construction Manager:

«Triton »
«1279 Route 300 »
«1st Floor »
« Newburgh, NY 12550 »

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.

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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.

1.2 BID BOND:

A. A Bid Bond will be required 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 Brewster Central School District 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. The American Institute of Architects Document A310, February 2010 edition entitled "Bid Bond" shall be the contract bond form for this project. A draft copy is attached.

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 A.M Best "Secured" rated or better.
2. 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.

B. 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 retained by the Owner shall be larger amount of (a) the Bid Bond or (b) 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

C. 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 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 and be AM Best Secured Rating of "A" or better as to Policy Holder Ratings and "VII" or better as to Financial Size Category Rated or better.

1. Paragraph 6 shall be deleted and substituted with the following:
   a. When the Claimant has satisfied the conditions of Paragraph 4, and has submitted all supporting documentation and any proof of claim requested by the Surety, the Surety shall, with reasonable promptness, notify the Claimant of the amounts that are undisputed and the basis for challenging any amounts that are disputed, including, but not limited to, the lack of substantiating documentation to support the claim as to entitlement or amount, and the Surety shall, with reasonable promptness, pay or make arrangements for payment of any undisputed amount; provided, however, that the failure of the Surety to timely discharge its obligations under this paragraph or to dispute or identify any specific defense to all or any

part of a claim shall not be deemed to be an admission of liability by the Surety as to such claim or otherwise constitute a waiver of the Contractor's or Surety's defenses to, or right to dispute, such claim. Rather, the Claimant shall have the immediate right, without further notice, to bring suit against the Surety to enforce any remedy available to it under this Bond."

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. 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 and 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.

H. The Contractor shall keep the surety informed of the progress of the Work, and, where necessary, obtain the surety's consent to, or waiver of: (1) request for reduction or release of retention; (2) request for final payment; and (3) any other material required by the surety. The Owner and Architect shall be notified by the Contractor, in writing, of all communications with the surety.

I. The Owner may, in the Owner's sole discretion and without prior notice to the Contractor, inform the Contractor's surety of the progress of the Contractor's work and obtain consents as necessary to protect the Owner's rights, interest, privileges and benefits under and pursuant to any bond issued in connection with the Contractor's Work.

J. If the surety on any bond furnished by the Contractor is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of this Article, the Contractor shall within ten (10) days thereafter substitute another Performance and Payment Bond and surety, both of which must be acceptable to the Owner.

K. Performance and payment bonds may be required from any Subcontractor whose subcontract exceeds One Hundred Thousand Dollars ($100,000.00). All such bonds shall be in the identical format of the Contractor's bonds.

L. 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 and is deemed to authorize the Owner and Architect to furnish a copy of the bonds

END OF SECTION

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR: **SURETY:**

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

BOND AMOUNT: $

PROJECT:
Brewster High School
Security Vestibule, New Synthetic Turf Field

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, NY 10509

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
Brewster High School
Security Vestibule, New Synthetic Turf Field

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ 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 When the Claimant has satisfied the conditions of Paragraph 4, and has submitted all supporting documentation and any proof of claim requested by the Surety, the Surety shall, with reasonable promptness, notify the Claimant of the amounts that are undisputed and the basis for challenging any amounts that are disputed, including, but not limited to, the lack of substantiating documentation to support the claim as to entitlement or amount, and the Surety shall, with reasonable promptness, pay or make arrangements for payment of any undisputed amount; provided, however, that the failure of the Surety to timely discharge its obligations under this paragraph or to dispute or identify any specific defense to all or any part of a claim shall not be deemed to be an admission of liability by the Surety as to such claim or otherwise constitute a waiver of the Contractor's or Surety's defenses to, or right to dispute, such claim. Rather, the

Claimant shall have the immediate right, without further notice, to bring suit against the Surety to enforce any remedy available to it under this Bond.

§ 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, NY 10509

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
Brewster High School
Security Vestibule, New Synthetic Turf Field

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ 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 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. The General Conditions applicable to this contract is attached following this page.

B. AIA® Document A232TM – 2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition is the General Conditions between the Owner and Contractor and has been revised. 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 AIA® Document A132™ – 2019 Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser 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:

Brewster High School
Security Vestibule, New Synthetic Turf Field

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.

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. The Contract Documents also include the Notice to Bidders, Instructions to Bidders, sample forms, and the Contractor's bid.

§ 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. In the event there is 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 and/or ambiguity 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)

§ 2.2 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 whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.2.5 The Owner shall provide upon written request, only, and as necessary to complete the work, 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. The Contract may purchase additional copies at the cost of reproduction, postage, and handling.

§ 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 five-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 carefully examined the Contract Documents and the site and represents that the Contractor is generally 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 thoroughly 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. 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 are waived and will not be permitted.

§ 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 in writing 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 but not limited to the Architect's additional fees, the Construction Manager's additional fees and the Owner's 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 work, 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 and/or Section 01 7000 Cutting and Patching.

§ **3.2.7** Where existing conditions are obscured or concealed from the Owner's or Architect's view prior to the start of this Project's construction activities, portrayal of such conditions in the documents is based on reasonable implications and assumptions. The Owner and Architect do not imply or guarantee to the Contractor in any way that such portrayals in the Documents are accurate or true.

§ **3.2.7.1** Physical investigations and testing of existing conditions were not undertaken by the Architect, unless so indicated in the Contract Documents.

§**3.2.7.2** The Contractor may submit written requests for information to the Architect to help facilitate the Contractor's performance of the contract. Prior to submitting each request for information, the Contractor shall first carefully study and compare the Contract Documents, field conditions, other Owner provided information, Contractor prepared

Coordination Drawings, and prior Project correspondence and documentation to determine that the information to be requested is not reasonably obtainable from such sources.

§ 3.2.7.3 Each request for information shall be submitted to the Architect, in writing, with a copy to the Construction Manager. Each request for information shall identify the specific sources which were reviewed by the Contractor in an effort to determine the information requested, and a statement to the effect that the information being requested could not be determined from such sources.

§ 3.2.7.4 The Contractor shall submit each request for information sufficiently in advance of the date by which such information is requested in order to allow the Architect or Triton Construction Co. LLC sufficient time, in the Architect's professional judgment, to permit adequate review and response and to permit Contractor compliance with the latest construction schedule.

§ 3.2.7.5 The Construction Manager shall maintain a log at the Project site that sequentially numbers and lists each request for information. This log shall contain the Drawings reference or Specification section to which the request pertains, the date of the request, to whom the request was made, by whom the request was made, the nature of the request, and the Architect's resolution thereof. This log shall be reviewed at each Project meeting and the status of the requests for information shall be made part of the minutes of such meetings.

§ 3.2.7.6 The Contractor shall reimburse the Owner amounts charged to the Owner by the Architect or Construction Manager for responding to Contractor requests for information where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information, Contractor prepared Coordination Drawings, or prior Project correspondence or documentation.

§ 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 sub-Subcontractors.

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

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. 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 maximum of fifteen days' notice to the Owner and Architect and shall include full documentation of all costs and the time necessary. The substitution shall not delay the Project. 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.

§ 3.4.2.1 After the Contract has been executed, the Owner and Architect will consider requests for the substitution of products in place of those specified only under the conditions set forth in the _01 2500 Specifications By making requests for substitutions, the Contractor:
.1 represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
.2 represents that it will provide the same warranty for the substitution as it would have provided for the product specified.
.3 certifies that the cost data presented is complete and includes all related costs for the substituted. product and for Work that must be changed as a result of the substitution, except for the Architect's redesign costs, and waives all claims for additional costs related to the substitution that subsequently become apparent; and
.4 shall coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
.5 Shall credit to the Owner any saved construction costs via an allowed substitution.

§ 3.4.2.2 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions for convenience after the period noted in Division 01 Section "Substitution Procedures" and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

§ 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. 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

(Paragraph deleted)

§ 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 The Owner, through the Construction Manager, shall secure and pay for the building permit from the New York State Education Department. 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.

§ 3.7.2.1 The Contractor shall comply with all applicable New York State Department of Labor requirements, including the provision that every worker employed in performance of a public work contract shall be certified as having completed an OSHA 10-hour safety training course. The Contractor and Subcontractor shall be solely responsible for compliance with this requirement with respect to their employees. The Contractor's or Subcontractor's failure to comply with this requirement shall not transfer or in any way impose the responsibility for worker safety upon the Owner or the Architect.

3.7.2.2 In accordance with New York State Labor Law Article 8, Section 220, subd. 3-a(a), the Contractor shall submit to the Owner within thirty (30) days after issuance of Contractor's first payroll, and every thirty (30) days thereafter, a transcript of the original payroll record, subscribed and affirmed as true under the penalties of perjury.

§ 3.7.3 If the Contractor or Subcontractor performs Work, which it knows or should have known was 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 in writing 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. Section 01 2100

§ 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 and designate 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 Project 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. Information and resume of any superintendent change shall be sent to the Owner and CM 30 days prior to removal of any Project superintendent. Prior written consent of changes to superintendent personnel shall be subject to prior written approval by the Owner.

§ 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 and shall comply with Section 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 maintain and 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 in good order and condition. 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 and coordinated 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.

§ 3.13.3 The Contractor shall be responsible for enforcing the Owner's security and access policies and procedures, the

Owner's Code of Conduct, and the following rules of conduct for its personnel and those of its subcontractors, sub-subcontractors, and suppliers at the Project site, and the Owner's Project Representative shall provide interpretations should a question arise if the rules of conduct are being adequately enforced by the Contractor:

.1 No smoking or use of tobacco products.
.2 No drinking of alcoholic beverages or use of controlled substances.
.3 No working, or presence on site, under the influence of alcoholic beverages or controlled substances.
.4 No use of indecent language or display of indecent images, publications or terms.
.5 No use of radios or other entertainment devices.
.6 No horseplay or dangerous behavior.
.7 No firearms or other weapons.

Note to Specifier: Retain the following subparagraph for a school project.

.8 No communication with staff or students.

§ 3.13.4 The Contractor shall require its personnel and those of its subcontractors, sub-subcontractors and suppliers to wear visible photo-identification badges acceptable to the Owner, at all times for identification and security purposes.

§ 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 removed construction debris, equipment, tools, 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 defend, indemnify, and hold harmless the Owner, Construction Manager, Architect and Architect's consultants, their officers, agents and employees of any of them from and against lawsuits, claims, damages, losses, and expenses, including but not limited to attorneys' fees and litigation costs, arising out of or resulting from performance of the Work, provided that such lawsuit, 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), including loss of use resulting therefrom, but only to the extent caused in whole or in part by the act, omission, fault, breach of contract, breach of warranty, or statutory violation 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.

§ 4.2.2.1 The Contractor shall reimburse the Owner for compensation paid to the Architect and/or Construction Manager for additional site visits made necessary by the fault, neglect, deficiencies in the work, or request of the Contractor.

§ 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, and the Owner, in writing, 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, in coordination with the Architect, 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 Add or Deduct 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 of 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 fourteen (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 agreements 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 the Contractor submits to the Construction Manager and Architect a written statement concerning the proposed award to the Subcontractor. The statement shall contain the 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, the General Contractor shall perform at least twenty-five percent (25%) of the field work by its own employees.

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

.2 Roofing Contractors shall perform at least eighty-five percent (85%) 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 Sub contractual 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, but not limited to, the responsibility for safety of the Subcontractor's Work, and obligations to defend and indemnify 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 in writing and in detail, any 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 incorrectly submitted 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 the 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 Sum. The unit prices or allowances when mutually agreed to be fair and equitable by Owner and Contractor will be made part of the Contract.

§ 7.2.2 Final determination of all Change Order proposals shall be determined 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 Sum, 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 Sum 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 #I)_____
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 an 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.

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

§ 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.

IT IS EMPHASIZED THAT NO MONETARY RECOVERY MAY BE OBTAINED BY THE CONTRACTOR FOR DELAY AGAINST THE OWNER, CONSTRUCTION MANAGER, OR ARCHITECT BASED ON ANY REASON AND THAT THE CONTRACTOR'S SOLE REMEDY, IF APPROPRIATE, IS ADDITIONAL TIME."

§ 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 Milestone Dates or 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 Milestone Dates and 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

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 (10) 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 suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.2.1 All 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 achieved Final Completion.

§ 9.3.2.2 In no case will more than ninety (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 the Construction Manager or Architect requires substantiating information, the Contractor shall submit data justifying dollar amounts in question, provide one copy of data with cover letter for each copy of submittal And show the 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 the Contractor and their subcontractors and a sworn and notarized statement that all subcontractors have been paid to at least ninety-five (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 withheld to the extent authorized under state law, until such lien is discharged in a manner permitted by law.

§ 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 (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 (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).
.14 failure of a Contractor to provide executed supplementary bid forms, performance and payment bonds, or a current Certificate of Insurance

§ 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 Intentionally Omitted

§ 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 No later than fourteen (14) days prior to the Contract-scheduled date of Substantial Completion, the Contractor shall
issue a letter to the Architect and Construction Manager confirming their work is on schedule for Substantial Completion by the Contract-specified date. No later than seven (7) days after Contract-scheduled date of Substantial Completion (including authorized adjustments), the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. Absent the Contractor letter confirming readiness of work, the Architect may elect to postpone the Substantial Completion inspection. If the Architect's inspection discloses any item 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 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 to determine the

actual date of Substantial Completion.
§ 9.8.1.2 Contractor shall advise Construction Manager and Architect of pending insurance changeover requirements.

§ 9.8.1.3 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 Contractor's punch 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: Per Spec Section 01 7800

§ 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.

§ 9.8.6 In the event the Contractor does not achieve final completion within sixty (60) days after the date of Substantial Completion, allowing for any approved extensions of the Contract time, Contractor shall not be entitled to any further payment and Contractor agrees that such failure to complete the work within the time set forth above shall constitute a waiver of all claims by the Contractor to any money that may be due. This provision shall not operate as a waiver by the Owner of any claims or remedies of any nature against the Contractor arising out of the Contract.

§ 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-five (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.

§ 9.10.6 If the Contractor is responsible for delays in the final completion and closeout beyond the contract specified time, the Owner shall be entitled to reimbursement from the Contractor for amounts paid by the Owner to subsequently extend the Electronic Submittal System (Submittal Exchange).

§ 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 Intentionally omitted.

§ 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 Triton Construction Co. LLC 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, Triton Construction Co. LLC 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, Construction 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. Policy exclusions may not be accepted.

.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.

(Paragraph deleted)

§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. A person seeking an exemption must file a CE-200 Form with the state. The form can be completed and submitted directly to the Workers' Compensation Board online.

.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	$2,000,000.00
Personal Injury:	$1,000,000.00
Fire Damage:	$100,000.00
Medical Expense:	$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.**
$5,000,000.00 per Occurrence and Aggregate for general construction work at elevation (1 story or 10 feet) and project values less than or equal to $1,000,000.

$10,000,000 each Occurrence and Aggregate for high-risk construction, work at elevation (>1 story or 10 feet) and project values greater than $1,000,000.

Umbrella/Excess coverage shall be on a follow-form basis or provide broader coverage over the 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 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 and/or work on 1 story (10 feet) only.:
$1,000,000.00 each occurrence.
$2,000,000.00 aggregate

Limits of Liability for project over 1,000,001 and/or work over 1 story (10 feet):
$2,000,000.00 each occurrence.
$4,000,000.00 aggregate
If the District chooses to accept a non-admitted or non-licensed carrier in New York State for General Liability, Auto and Umbrella/Excess Coverages, the minimum required limits of coverage for the OCP is $2,000,000 per occurrence, $4,000,000 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.

(Paragraph deleted)
§11.1.5 Subcontractors Insurance: The Contractor agrees to provide all Subcontractors 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 Subcontractor's insurance certificates and said records shall be available for inspection by the Owner, Construction Manager and Architects for a period of two (2) years from the date of final acceptance.

§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 its 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, Board, 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** thirty (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 it 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 its 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 domiciled. The companies must be **A. M. Best A-Rated** 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) 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 an adjustment shall occur whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

§ 13.1.1

The Contract shall be governed by the law of the place where the Project is located. The parties expressly agree that any claim, dispute or other controversy of any nature arising out of the Contract or performance of the Work shall be commenced and maintained in Supreme Court, Putnam County, or the United State District Court, Southern District of New York, if applicable.

§ 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.

(Paragraph deleted)

§ 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 to Contractor, including any interest, shall be consistent with this Agreement and in accordance with New York State General Municipal Law Section 106-b. .

§ 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 Contractor 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 Submittals for additional requirements.

§ 13.2 Severability

§ 13.2.1 Should any provision of this Agreement be finally determined by any court of competent jurisdiction to be invalid or unenforceable for any reason, the invalidity or unenforceability of such provision shall not affect the validity of the remaining provisions of this Agreement, unless such invalidity or unenforceability would defeat an essential purpose of this Agreement, in which case, the Agreement shall be terminated.

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 thirty (30) days' written notice to the Owner, Construction Manager and Architect, with reasonably opportunity to cure, terminate the Contract and recover from the Owner payment for Work properly 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** refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- **.4** otherwise breaches a material provision of the Contract Documents;
- **.5** If the Contractor fails to satisfy or bond any filed liens against the Owner in the performance of the 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; or
- **.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, 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. The costs of finishing the Work include, without limitations, all reasonable attorney's fees incurred by the Owner, additional Architect/Engineering and Construction Manager costs, insurance, additional interest because of any delay in completing 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.

14.2.6 In the event any principal, employee, agent or representative of the Contractor violates the Owner's policies, including but not limited to the Owner's Code of Conduct, the Owner may, at its sole discretion, require the Contractor to remove such individual from the Project site upon such terms and conditions as the Owner directs.

§ 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 may be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. 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 Notwithstanding any other provision to the contrary in this Agreement, the Owner reserves the right at any time and in its absolute discretion to terminate the services of the Contractor and/or the Work for the Owner's convenience and without cause by giving written notice to the Contractor. This termination for the convenience of the Owner provision allows and authorizes the Owner to terminate this Agreement at any time and for any reason whatsoever. This right may be exercised by the Owner in its complete discretion.

§ 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.

§ 15.1.2.1 Claims by the Contractor must be made by written notice in accordance with the following procedures.

.1 the Contractor may submit a claim concerning a matter properly noticed in accordance with the time requirements of this Contract set forth in paragraph 15.1.2 and elsewhere;

.2 failure by the Contractor to furnish the required claim documentation within the time set forth above shall constitute waiver of the Contractor's right to compensation for such claim.

.3 Contractor shall furnish three (3) certified copies of the required claim documentation. The claim documentation shall be complete when furnished. The evaluation of the Contractor's claim will be based, among other things, upon the Owner's Project Records and the Contractor's furnished claim documentation

.4 claim documentation shall conform to Generally Accepted Accounting Principles and shall be in the following format:

- a. general introduction;
- b. general background discussion
- c. issues
  - i. index of issues (listed numerically);
  - ii. for each issue:
    - (1) background
    - (2) chronology
    - (3) Contractor's position (reason for Owner's potential liability)
    - (4) supporting documentation of merit or entitlement
    - (5) supporting documentation of damages
    - (6) begin each issue on a new page
- d. all critical path method schedules (as-planned, monthly updates, schedule revisions and as-built, along with computer disks of all schedules related to the claim;
- e. productivity exhibits (if appropriate); and
- f. summary of issues and damages.

.5 supporting documentation of merit for each issue shall be cited by reference, photocopies or explanation. Supporting documentation may include, but shall not be limited to General Conditions, General Requirements, technical specifications, drawings, correspondence, conference notes, shop drawings and submittals, shop drawing logs, survey books, inspection reports, delivery schedules, test reports, daily reports, subcontracts, fragmentary CPM schedules or time impact analyses, photographs, technical reports, requests for information, field instructions and all other related records necessary to support the Contractor's claim.

.6 supporting documentation of damages for each issue shall be cited, photocopied or explained. Supporting documentation may include, but shall not be limited to, any or all documents related to the preparation and submission of the bid; certified, detailed labor records including labor distribution reports; material and equipment procurement records; construction equipment ownership, cost records or rental records; subcontractor or vendor files and cost records; service cost records;

purchase orders; invoices; Project as-planned and as-built cost records; general ledger records; variance reports; accounting adjustment records, and any other accounting material necessary to support the Contractor's claims.

.7 each copy of the claim documentation shall be certified by a responsible officer of the Contractor in accordance with the requirements of these Contract Documents.

§ 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. 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 in the manner provided in Section 15.1.2.1. A claim submittal without full documentation in the manner provided in Section 15.1.2.1 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 Architect shall 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, may 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 may, 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. 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. The 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 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)

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 00 5000 - Contracting Forms and Supplements.

B. 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 protection while performing any work.
20. The Prime Contractors shall be responsible for any loss or damage to his 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 these 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 noOwner 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. One (1) week 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. 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: (See next page)

Triton Construction

1279 Route 300, 1st Floor

Newburgh, New York 12550

_____, 2024

Contractor Name and Address:_____

_____

Name of Project: _____

Dear Sir/Madam:

Reference is made to your contract ("Contract") with Brewster Central School District ("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

_____, 2024

Contractor Name and Address:_____

_____

Name of Project: _____

Dear Sir/Madam:

Reference is made to your contract ("Contract") with Brewster Central School District ("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 Division 1 Specification Sections, apply to this Section.

1.2 PROJECT

Project Description: BHS Security Vestibule, Synthetic Fields & Related Work

Facility: Brewster High School

Address: 50 Foggintown Road .

Owner: Brewster Central School District

Address: 30 Farm To Market Road
Brewster, NY 10509

Architect: Fuller and D'angelo P.C.

Construction Mgr. Triton Construction

A. The Project consists of the the construction of:
Security Vestibule, canopy and adjoining Security Office, including new construction and modifications to mechanical, plumbing, electrical, security and low voltage systems.

Rehabilitation of the existing curved roof adjacent to the Security Vestibule.

The reconstruction and rehabilitation of two concrete pedestrian bridges.

Replacement of two existing rooftop units ,serving the Locker Rooms, with Energy Recovery Units. Include related roof and ceiling modifications.

Replacement of synthetic turf carpet at Field #3.

Replacement of the Track and installation of a synthetic Turf Field at existing grass Field #8. Asphalt walkway and lighting.

Parking lot expansions and improvements. Main road realignments. ADA access to walking paths and fields.

Elevator Modernization. Remove existing elevator and hydraulics. Provide new hydraulics, cab and related items within existing elevator shaft.

1.3 DEFINITIONS

A. Refer to General Conditions and Section 01 4216 for Definitions

1.4 CONTRACT DESCRIPTION

A. Contract Type: 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. General Construction Contract #1
   2. Plumbing Contract #2
   3. Heating, Ventilating, Air-Conditioning (HVAC) Contract #3
   4. Electrical Contract #4
   5. Site Contract #5
   6. Elevator Contract #6

B. The work of each Contractor is identified in this Project Manual and on the Drawings.

C. 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.

D. 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, if any, this section of the Specifications, followed by the other Division-l sections and finally with the Drawings and other Sections of the Specifications.

E. 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 Fuller and D'Angelo, P.C. attention in writing for determination.

F. Summary by References: Work of the Contract can be summarized by reference to the Specification Sections, Drawings, or Addenda 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 Contract 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 5200 - Agreement Form: Contract Sum.

B. Section 00 7200 - General Conditions : Additional requirements for progress payments and Changes in the Work.

C. Section 01 1010 - Milestone Schedule.

D. Section 01 2000 - Price and Payment Procedures.

E. Section 01 2100 - Allowances.

F. Section 01 2300 - Alternates Payment procedures relating to alternates.

G. Section 01 3553 - Site Safety and Security Procedures.

H. Section 01 5000 - Temporary Facilities and Controls.

I. Section 01 5213 - Field Offices and Sheds.

J. Section 01 5510 - Traffic and Pedestrian Access & Control.

K. Section 01 5500 - Vehicular Access and Parking.

L. Section 01 5713 - Temporary Erosion and Sediment Control.

M. Section 01 5719 - Temporary Environmental Controls.

N. Section 01 7000 - Execution.

O. Section 01 7900 - Demonstration and Training

P. Section 01 9113 - General Commissioning Requirements

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, the Contractor shall notify the Architect 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 subcontractor 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 Owner, Owner's Representative, Architect, and Consultants, 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. Each 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

E. If the Contractor has engaged the services of workers and/or subcontractor 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 Fuller and D'Angelo, P.C. and Construction Manager, 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.

F. Each 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 SUBCONTRACTORS/SUPPLIERS

A. All subcontractors shall be submitted to Fuller and D'Angelo, P.C. and Construction Manager for approval.

1.8 DESCRIPTION OF ALTERATIONS WORK

A. The scope of removal and alterations work is shown on drawings.

B. Refer to paragraph 1.3 for general scope of project

C. Maintain all building systems in operation when the Facility is occupied during construction until acceptance of the project.

D. Plumbing: Alter existing system and add new construction, keeping existing in operation.

E. HVAC: Alter existing system and add new construction, keeping existing in operation.

F. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.

G. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.

H. Security System: Alter existing system and add new construction, keeping existing in operation.

I. Brewster Central School District will remove the following items before start of work:
   1. All movable equipment, furniture, books etc. from all classrooms and spaces being renovated.

1.9 OWNER OCCUPANCY

A. Brewster Central School District intends to continue to occupy adjacent portions of the existing building and site during the entire construction period.

B. Brewster Central School District intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner's Representative and Architect to minimize conflict and to facilitate Brewster Central School District's operations.

D. Schedule the Work to accommodate Owner's occupancy.

E. Refer to paragraph 1.13 Sequence Work.

F. Cooperate with Construction Manager to minimize conflict and to facilitate Brewster Central School District's operations.

G. Schedule the Work to accommodate Owner's occupancy.

1.10 CONTRACTOR USE OF SITE AND PREMISES

A. Provide access to and from site as required by law and by Construction Manager:
   1. Emergency Building Exits During Construction: Keep all exits required by code 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.

B. Existing building spaces may not be used for storage unless approved by the Construction Manager.

C. Time Restrictions:
   1. As indicated. Verify and coordinate with Owner.

D. Contractors shall comply with Local Noise Ordinance. Work disrupting the community must be performed within the hours as set forth by local ordinances.:

E. 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 and school is in session.

F. During the entire construction period the Contractor(s) shall have the use of the premises for construction operations, including use of the site as indicated in milestone schedule and work time 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 Contractor shall administer allocation of available space equitably among the separate prime(s) 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. Each 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. Each Prime Contractors shall to maintain clear and unobstructed paths of exit discharge from all existing exits.
   4. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available at all times. Do not use these areas for parking or storage of materials.
   5. 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.

G. 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.

H. Site work shall be scheduled and coordinated with prime contract(s) and the Construction Manager whose 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

I. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas designated by Construction Manager. If additional storage is necessary obtain and pay for such storage off-site.

J. 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 Owner.

K. Contractor(s) 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.

L. Without prior approval of the Construction Manager, each 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, the Contractor shall use its best efforts to comply with the rules and regulations promulgated by the Construction Manager in connection with the use and occupancy of the Project Site, and the Building, as amended from time to time. The Contractor shall immediately notify the 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. The Construction Manager may, at the Construction Manager's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations. The Contractor shall also comply with all insurance requirements, applicable to use, and occupancy of the Project Site and the Building.

M. 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.

N. Keep public areas such as hallways, stairs, elevator lobbies, and toilet rooms free from accumulation of waste material, rubbish or construction debris.

O. Smoking, drinking of alcoholic beverages or open fires will not be permitted on the project site.

P. 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.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire alarm system, electrical, data, and heating system, and water supply, without 7 days notice to Construction Manager and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

1.11 AVAILABILITY OF EXISTING BUILDING

A. Upon request by the Contractor, the building may be made available, at the discretion of the Owner's Representative and at the Cost to 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 Saturdays, and Holidays.

1. 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.
2. Weekend, Holiday and Night Work:
    a. The contractor shall make no claim for delay for the inability of the Owner to make the site available for off-hours work. Should the Owner make the site available during these hours at the contractor's request, the cost will be borne by the Contractor.

B. 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.

1.12 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 costs 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 Contractor 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.

1.13 WORK SEQUENCE

A. Refer to Section 01 1010 - Milestone Schedule.

1.14 SPECIFICATION SECTIONS

A. Unless otherwise noted, all provisions of Division 01 General Requirements apply to all contracts.

1. 01 1000 SUMMARY OF CONTRACTS
2. 01 1010 MILESTONE SCHEDULE
3. 01 2000 PRICE AND PAYMENT PROCEDURES
4. 01 2005 PARTIAL RELEASE OF LIEN
5. 01 2100 ALLOWANCES
6. 01 2300 ALTERNATES
7. 01 2500 SUBSTITUTION PROCEDURES
8. 01 3000 ADMINISTRATIVE REQUIREMENTS
9. 01 3216 CONSTRUCTION PROGRESS SCHEDULE
10. 01 3306 - NON-DESCRIMINATION CLAUSE
11. 01 3307 SED SPECIAL REQUIREMENTS
12. 01 3553 SITE SAFETY AND SECURITY PROCEDURES
13. 01 4000 QUALITY REQUIREMENTS

14. 01 4100 REGULATORY REQUIREMENTS
15. 01 4216 DEFINITIONS
16. 01 4219 REFERENCE STANDARDS
17. 01 4533 CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES
18. 01 5000 TEMPORARY FACILITIES AND CONTROLS
19. 01 5213 FIELD OFFICES AND SHEDS
20. 01 5500 VEHICULAR ACCESS AND PARKING
21. 01 5713 TEMPORARY EROSION AND SEDIMENT CONTROL
22. 01 5719 TEMPORARY ENVIRONMENTAL CONTROLS
23. 01 5813 TEMPORARY PROJECT SIGNAGE
24. 01 6000 PRODUCT REQUIREMENTS
25. 01 6116 VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS
26. 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS
27. 01 7310 CUTTING AND PATCHING
28. 01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
29. 01 7600 PROCEDURES AND SPECIAL CONDITIONS FOR SEPARATE PRIME CONTRACTS
30. 01 7800 CLOSEOUT SUBMITTALS
31. 01 7900 DEMONSTRATION AND TRAINING
32. 01 9113 GENERAL COMMISSIONING REQUIREMENTS

1.15 GENERAL CONSTRUCTION CONTRACT

A. Division 01 - General Requirements.
   1. Specification sections listed above.

B. Provide all work as specified, but not limited to, the following sections:
   1. DIVISION 02 – EXISTING CONDITIONS
      a. 02 2080 ASBESTOS REMOVAL AND DISPOSAL
   2. DIVISION 03 CONCRETE
      a. 03 3000 CAST-IN-PLACE CONCRETE
      b. 03 0100 MAINTENANCE OF CONCRETE
   3. DIVISION 04 MASONRY
      a. 04 2000 UNIT MASONRY
      b. 04 7200 CAST STONE MASONRY
   4. DIVISION 05 METALS
      a. 05 1200 STRUCTURAL STEEL FRAMING
      b. 05 3100 STEEL DECKING
      c. 05 4000 COLD FORM METAL FRAMING
      d. 05 5000 METAL FABRICATIONS
      e. 05 5213 PIPE AND TUBE RAILINGS
   5. DIVISION 06 WOOD, PLASTICS, AND COMPOSITES
      a. 06 1000 ROUGH CARPENTRY
      b. 06 1010 ROOF RELATED ROUGH CARPENTRY
   6. DIVISION 07 THERMAL AND MOISTURE PROTECTION
      a. 07 0150.16 MAINTENANCE CLEANING OF MEMBRANE ROOFING
      b. 07 0150.73 REHABILITATION OF MODIFIED BITUMINOUS MEMBRANE ROOFING
      c. 07 1113 BITUMINOUS DAMPROOFING
      d. 07 2100 THERMAL INSULATION

e. 07 2500 WEATHER BARRIERS
f. 07 4213 ALUMINUM SOFFIT PANELS
g. 07 5419 PVC THERMOPLASTIC SINGLE PLY ROOFING
h. 07 5600 FLUID APPLIED ROOFING
i. 07 6200 SHEET METAL FLASHING AND TRIM
j. 07 8400 FIRESTOPPING
k. 07 9200 JOINT SEALANTS
l. 07 9513 EXPANSION JOINT COVER ASSEMBLIES

7. DIVISION 08 OPENINGS
   a. 08 1113 HOLLOW METAL DOORS AND FRAMES
   b. 08 1116 ALUMINUM DOORS AND FRAMES
   c. 08 3100 ACCESS DOORS AND PANELS
   d. 08 3313 COILING COUNTER DOORS
   e. 08 4313 ALUMINUM FRAMED STOREFRONTS
   f. 08 5659 SERVICE AND TELLER WINDOW UNITS
   g. 08 7110 FINISH HARDWARE
   h. 08 8000 GLAZING
8. DIVISION 09 FINISHES
   a. 09 2116 GYPSUM BOARD ASSEMBLIES
   b. 09 3000 TILING
   c. 09 5100 ACOUSTICAL CEILINGS
   d. 09 6500 RESILIENT FLOORING
   e. 09 9113 EXTERIOR PAINTING
   f. 09 9123 INTERIOR PAINTING
9. DIVISION 10 – SPECIALTIES
   a. 10 1400 SIGNAGE
10. DIVISION 12 FURNISHINGS
   a. 12 2113 HORIZONTAL LOUVER BLINDS
   b. 12 3200 PLASTIC LAMINATED CASEWORK
   c. 12 4813 ENTRANCE FLOOR MATS AND FRAMES
11. DIVISION 31 EARTHWORK
   a. 31 2316 EXCAVATION - BUILDING
12. DIVISION 32 EXTERIOR IMPROVEMENTS
   a. 32 1313 Cast in place concrete - (Site work related to Security Vestibule only)
   b. 32 3113 Chain Link Fence

1.16 SITE CONTRACT

A. Provide all work as specified ,but not limited to, the following sections:
1. DIVISION 31 EARTHWORK
   a. 31 1000 SITE CLEARING
   b. 31 2200 EARTH MOVING
   c. 31 2319 DE-WATERING
   d. 31 2333 TRENCHING AND BACKFILLING
   e. 31 2500 EROSION AND SEDIMENT CONTROL
   f. 31 5000 EXCAVATION SUPPORT AND PROTECTION
2. DIVISION 32 EXTERIOR IMPROVEMENTS
   a. 32 1216 ASPHALT PAVING

b. 32 1313 CAST IN PLACE CONCRETE - SITE (Not including Site work at the Security Vestibule area.)
c. 32 1714 TRAFFIC SIGNS
d. 32 1723.13 PAINTED PAVEMENT MARKINGS
e. 32 1726 - TACTILE WARNING SURFACING
f. 32 1810 EROSION CONTROL AND INSPECTIONS OF SEDIMENT CONTROLS
g. 32 1813 SYNTHETIC GRASS SURFACING
h. 32 1823 RESILIENT SURFACING
i. 32 1824 TRACK MARKINGS
j. 32 3113 CHAIN LINK FENCES
k. 32 9200 TURFS AND GRASSES

3. DIVISION 33 UTILITIES
a. 33 1400 WATER UTILITY TRANSMISSION AND DISTRIBUTION
b. 33 3000 SANITARY SEWERAGE
c. 33 4100 STORM UTILITY DRAIN PIPING

1.17 PLUMBING CONTRACT

A. Provide all Work as specified, but not limited to, the following sections:

B. Division 07 - Thermal and Moisture Protection:
1. Section 07 8400 - Firestopping.
2. Section 07 9200 - Joint Sealants

C. Division 08 - Openings:
1. Section 08 3100 - Access Doors and Panels: Access doors and panels.

D. DIVISION 22 – PLUMBING
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
1.

1.18 HEATING, VENTILATING, AND AIR CONDITIONING CONTRACT

A. Specification sections listed Division 01 - General Requirements above as applicable.

B. Provide all work as specified, but not limited to, the following sections:

C. Division 07 - Thermal and Moisture Protection:
1. 07 8400 - Firestopping.
2. 07 9200 - Joint Sealants.
3. 08 3100 - Access doors panels

D. DIVISION 23 HVAC
23 0500 - BASIC MECHANICAL MATERIALS AND METHODS
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 2213 - STEAM AND CONDENSATE HEATING PIPING
23 2216 - STEAM AND CONDENSATE HEATING PIPING SPECIALTIES
23 2300 - REFRIGERANT PIPING
23 3113 - METAL DUCTS
23 3300 - DUCT ACCESSORIES
23 3423 - HVAC POWER VENTILATORS
23 3713 - DIFFUSERS, REGISTERS AND GRILLES
23 7200 - AIR TO AIR ENERGY RECOVERY EQUIPMENT
23 7416 - PACKAGED RTU 's
23 8129 - VARIABLE REFIGERANT FLOW HVAC SYSTEMS

1.

1.19 ELECTRICAL CONTRACT

A. Specification sections listed Division 01 - General Requirements

B. Provide all work as specified ,but not limited to, the following sections:

C. Division 07 - Thermal and Moisture Protection:
1. Section 03 3000 - Cast in place concrete
2. Section 06 1000 - Rough Carpentry
3. Section 07 8400 - Firestopping.
4. Section 07 9200 - Joint Sealants .
5. Section 08 3100 - Access Doors and Panels:
6. Section 31 2333 - Trenching and Backfilling

D. 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 0544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 2416 - PANELBOARDS
26 2726 - WIRING DEVICES
26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

E.
1. 26 0100 GENERAL CONDITIONS
2. 26 0125 SCOPE OF WORK
3. 26 0150 APPROVED MANUFACTURERS
4. 26 0200 CONDUIT
5. 26 0250 DUCT BANK
6. 26 0300 WIRE AND CABLE
7. 26 0320 OVERCURRENT PROTECTIVE DEVICES
8. 26 0350 BOXES
9. 26 0400 WIRING DEVICES
10. 26 0425 DIGITAL LIGHTING CONTROL SYSTEM
11. 26 0450 CABINETS AND ENCLOSURES
12. 26 0500 SUPPORTING DEVICES
13. 26 0550 GENERAL LABELING AND IDENTIFICATION

14. 26 0575 INTERIOR LUMINAIRES
15. 26 0600 DISCONNECT SWITCHES
16. 26 0650 GROUNDING
17. 26 0700 PANELBOARDS
18. 26 0725 SWITCHBOARD
19. 26 0750 ELECTRIC SERVICE
20. 26 0770 SURGE PROTECTION DEVICES
21. 26 0775 PACKAGED ENGINE GENERATOR SYSTEMS – DIESEL OUTDOOR
22. 26 0785 AUTOMATIC TRANSFER SWITCH
23. 26 0800 FIRE ALARM SYSTEM
24. 26 0825 PUBLIC ADDRESS SYSTEM
25. 26 0890 ELECTRICAL SYSTEMS COMMISSIONING
26. 26 0900 GUARANTEE

1.20 ELEVATOR CONTRACT

A. DIVISION 14 CONVEYING EQUIPMENT
   1. 14 2020 - ELEVATOR MODERNIZATION

B. Division 26 - Electrical: Every section included in Project Manual.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

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 REGLATORY 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 paragraph (A) in Section 5, below.

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 _____
2.	Pre-Bid Meeting	Date _____
3.	Contractor's RFIs Due	Date _____
4.	Bids Received	Date _____
5.	Bidders Qualification Meetings	Date _____
6.	Tentative Bid Award	Date _____
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

MILESTONE SCHEDULE

_____

1. Tasks: Schedule of Values, Progress Schedule, Contracts, Bonds and Insurance, Field verification of existing conditions, and Submittals.
2. Completion date: _____.

PHASE 1 CONSTRUCTION:

1. _____
2. Construction: Start Date .
3. Completion Date:
   a. _____.
   b. _____.

PHASE 2 CONSTRUCTION

1. _____.
2. _____
3. _____

_____

PHASE 3A (For Phase 1 work).

1. Start Date:
   a. _____.
   b. _____.
2. Completion Date:
   a. _____.
   b. _____.

PHASE 3B (For Phase 2 work).

1. _____
2. _____

_____

1. PHASE 4A Punch List
   a. Start Date: Two (2) weeks prior to the completion dates of Phase 1 and Phase 2

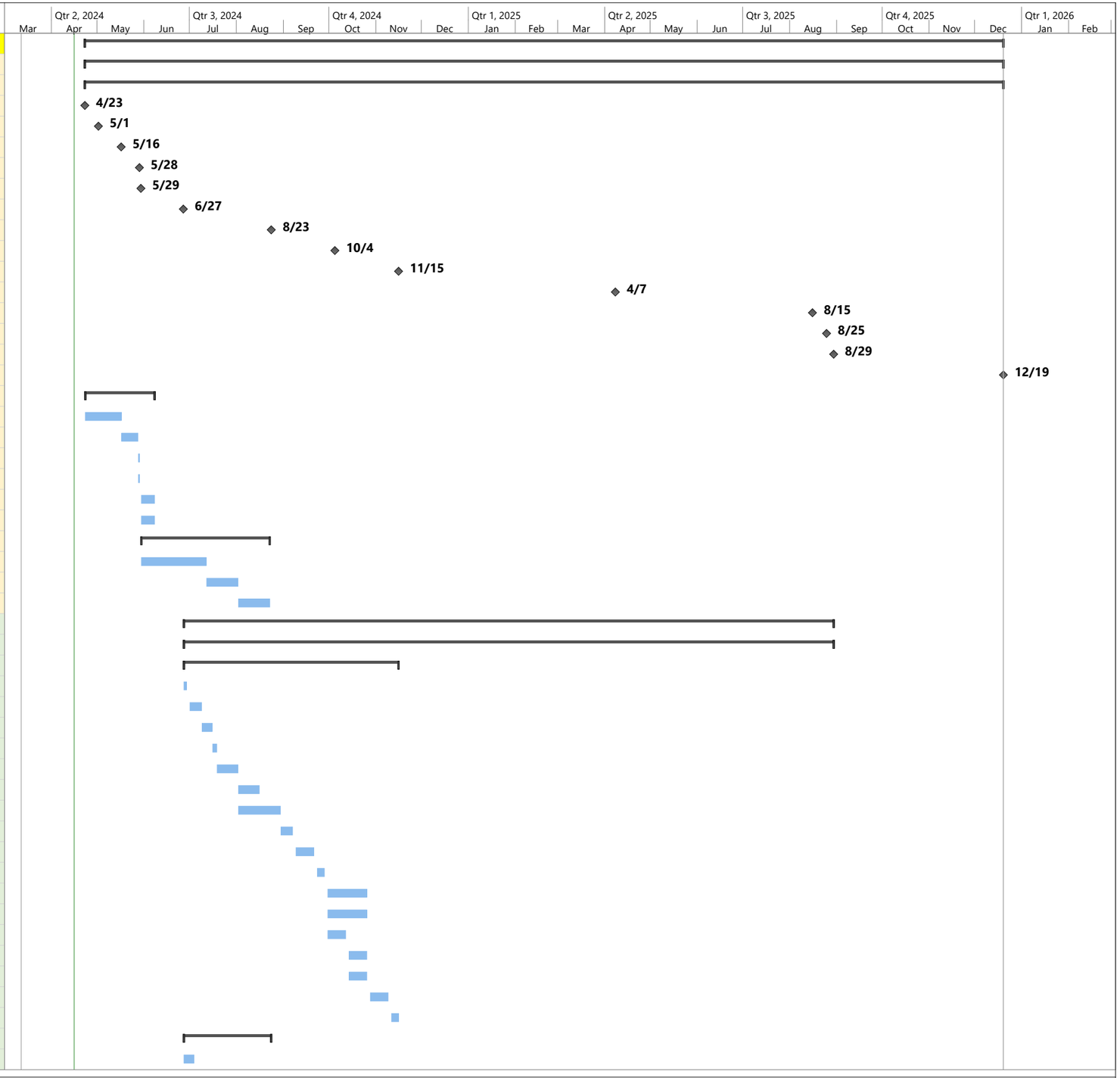
b. Completion Phase 4A:

2. PHASE 4B Closeout
   a. Start Date: After Substantial Completion

A. All work required by any of the Owner's representatives and consultants, including the Architect, Architect's consultants, Construction Manager, and Owner's Attorneys, etc etc., to execute final close-out of contract after 30 days beyond Milestone dates if determined to be caused by Contractor, shall result in payment(s) to the Owner's representatives and consultants, including the Architect, Architect's consultants, Construction Manager, and Owner's Attorneys, etc etc., in the form of a change order deduct to the base contract.

END OF SECTION

ID	Task Name	Duration	Start	Finish
1	**Brewster School District - Phase 1 of 2023 Bond Capital Improvement Project**	**427 days**	**Tue 4/23/24**	**Fri 12/19/25**
2	**Pre-Construction**	**427 days**	**Tue 4/23/24**	**Fri 12/19/25**
3	**Milestones**	**427 days**	**Tue 4/23/24**	**Fri 12/19/25**
5	Bid Documents Released for Public Bid	0 days	Tue 4/23/24	Tue 4/23/24
6	Site Walk-Thru	0 days	Wed 5/1/24	Wed 5/1/24
7	Bid Opening	0 days	Thu 5/16/24	Thu 5/16/24
8	Contractor Award - Board Approval	0 days	Tue 5/28/24	Tue 5/28/24
9	Notice to Proceed	0 days	Wed 5/29/24	Wed 5/29/24
10	Construction Start	0 days	Thu 6/27/24	Thu 6/27/24
12	Complete Discus and Shot Put - Field 9	0 days	Fri 8/23/24	Fri 8/23/24
4	Complete Turf Field Replacement - Field 3	0 days	Fri 10/4/24	Fri 10/4/24
15	Complete Pole Vault/Long Jump/Javalin Field & Storm Water Basins- Field 9	0 days	Fri 11/15/24	Fri 11/15/24
13	Complete Security Vestibule	0 days	Mon 4/7/25	Mon 4/7/25
14	Complete Track & Field, and New Parking - Field 8	0 days	Fri 8/15/25	Fri 8/15/25
11	Complete Elevator	0 days	Mon 8/25/25	Mon 8/25/25
16	Complete HVAC Upgrades	0 days	Fri 8/29/25	Fri 8/29/25
17	Substantial Completion Filed @ SED	0 days	Fri 12/19/25	Fri 12/19/25
18	**Bid and Award**	**34 days**	**Tue 4/23/24**	**Fri 6/7/24**
19	Bid Duration	18 days	Tue 4/23/24	Thu 5/16/24
20	Contractor Vetting/Scope Reviews	7 days	Fri 5/17/24	Mon 5/27/24
21	Recommendation for Award	1 day	Tue 5/28/24	Tue 5/28/24
24	Board Review of Recommendations	1 day	Tue 5/28/24	Tue 5/28/24
22	Contractor Insurances and Bonds	7 days	Thu 5/30/24	Fri 6/7/24
23	Contracts Prepared and Signed	7 days	Thu 5/30/24	Fri 6/7/24
25	**Procurement**	**60 days**	**Thu 5/30/24**	**Thu 8/22/24**
26	Submittals - Submit/Review/Approve	30 days	Thu 5/30/24	Thu 7/11/24
27	Order & Fabricate Materials (Long Lead Items Separate from this Duration)	15 days	Fri 7/12/24	Thu 8/1/24
28	Deliver Materials	15 days	Fri 8/2/24	Thu 8/22/24
29	**Construction**	**301 days**	**Thu 6/27/24**	**Fri 8/29/25**
30	**Sitework**	**301 days**	**Thu 6/27/24**	**Fri 8/29/25**
31	**Field 9 - Pole Vault/Long Jump/Javalin Field & Storm Water Basins**	**100 days**	**Thu 6/27/24**	**Fri 11/15/24**
32	Mobilize Fencing and Signage	2 days	Thu 6/27/24	Fri 6/28/24
33	Erosion Control	5 days	Mon 7/1/24	Mon 7/8/24
34	Clear and Grub	5 days	Tue 7/9/24	Mon 7/15/24
35	Stockpile Soils	3 days	Tue 7/16/24	Thu 7/18/24
36	Rough Grade new storm water basins	10 days	Fri 7/19/24	Thu 8/1/24
37	Spillway/Outlets and Storm Piping/Under Drains	10 days	Fri 8/2/24	Thu 8/15/24
38	Sewer Manholes and Piping	20 days	Fri 8/2/24	Thu 8/29/24
39	Finish Grade @ Storm Water Basins	5 days	Fri 8/30/24	Fri 9/6/24
40	Plantings @ Basins	10 days	Mon 9/9/24	Fri 9/20/24
41	Grade and Prep for Finish Surfaces	5 days	Mon 9/23/24	Fri 9/27/24
42	Javalin and Throw Area	20 days	Mon 9/30/24	Fri 10/25/24
43	Pole Vault	20 days	Mon 9/30/24	Fri 10/25/24
44	Walk Ways and Pads	10 days	Mon 9/30/24	Fri 10/11/24
45	Fencing	10 days	Mon 10/14/24	Fri 10/25/24
47	Gravel Parking Area	10 days	Mon 10/14/24	Fri 10/25/24
46	Finish Grade and Seed	10 days	Mon 10/28/24	Fri 11/8/24
48	Clean up and Demob	5 days	Mon 11/11/24	Fri 11/15/24
49	**Field 9 - Discus and Shot Put**	**41 days**	**Thu 6/27/24**	**Fri 8/23/24**
50	Mobilize Fencing and Signage	5 days	Thu 6/27/24	Wed 7/3/24



Brewster School District
High School Additions and Renovations Pacakge 1
Bid Schedule: Tue 4/16/24

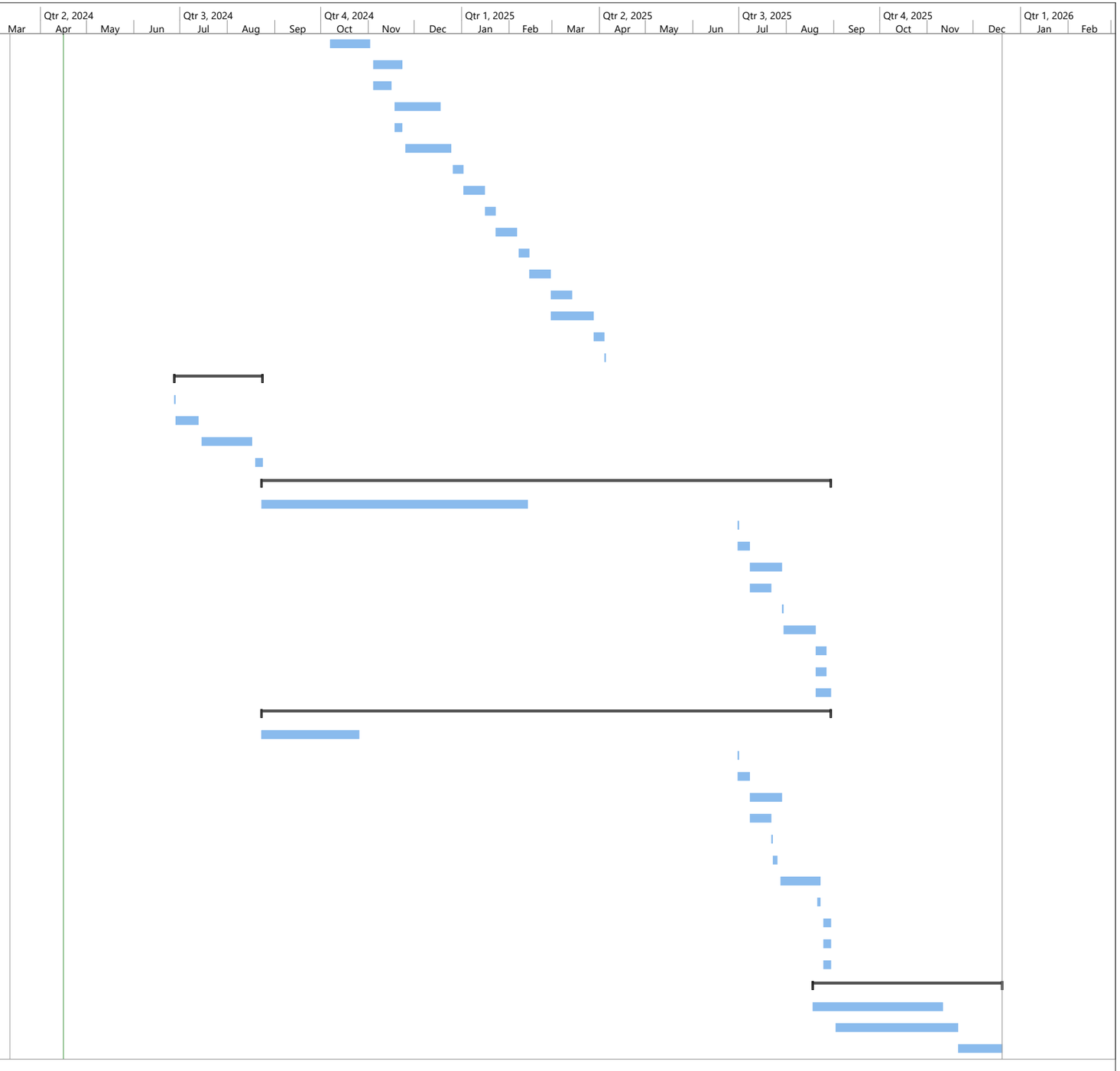
Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

ID	Task Name	Duration	Start	Finish
51	Erosion Control	5 days	Fri 7/5/24	Thu 7/11/24
52	Install New Shot Put	15 days	Fri 7/12/24	Thu 8/1/24
53	Install New Discus	15 days	Fri 7/19/24	Thu 8/8/24
54	Repair Lacrosse Field Grass	5 days	Fri 8/9/24	Thu 8/15/24
55	Seed	5 days	Fri 8/16/24	Thu 8/22/24
56	Clean up and Demob	1 day	Fri 8/23/24	Fri 8/23/24
63	**Field 8 - Track/Field and New Parking/Road**	**301 days**	**Thu 6/27/24**	**Fri 8/29/25**
64	Mobilize Fencing and Signage	5 days	Thu 6/27/24	Wed 7/3/24
65	Erosion Control	5 days	Thu 6/27/24	Wed 7/3/24
66	Clear and Grub	5 days	Mon 7/1/24	Mon 7/8/24
67	Demo Existing	10 days	Mon 7/1/24	Mon 7/15/24
68	Rough Grade	10 days	Mon 7/1/24	Mon 7/15/24
69	Electrical Underground Rough	30 days	Wed 7/3/24	Wed 8/14/24
70	Light Pole Bases	15 days	Thu 8/15/24	Thu 9/5/24
71	Storm/Sewer Underground Rough	30 days	Fri 9/6/24	Thu 10/17/24
72	Retaining Walls	20 days	Fri 10/18/24	Thu 11/14/24
73	Goal Post Footings	5 days	Fri 11/15/24	Thu 11/21/24
78	Light Poles	60 days	Fri 11/22/24	Tue 2/18/25
74	Field Turf Drainage System	20 days	Wed 2/19/25	Tue 3/18/25
75	Subbase Prep for Field Turf	10 days	Wed 3/19/25	Tue 4/1/25
76	Subbase Prep for Track Asphalt	10 days	Wed 4/2/25	Tue 4/15/25
77	Asphalt Track and Walk around Track	10 days	Wed 4/16/25	Tue 4/29/25
79	Sythetic Track Surface	15 days	Wed 4/30/25	Tue 5/20/25
80	Field Turf Carpet	20 days	Wed 5/21/25	Tue 6/17/25
81	Football Posts	5 days	Wed 6/18/25	Tue 6/24/25
82	Concrete Curbs and Walks	10 days	Wed 6/25/25	Wed 7/9/25
83	Bleachers	5 days	Thu 7/10/25	Wed 7/16/25
84	Fencing & Guard Rails	15 days	Thu 7/10/25	Wed 7/30/25
85	Asphalt Road	20 days	Thu 7/10/25	Wed 8/6/25
86	Seeding and Plantings	10 days	Thu 7/31/25	Wed 8/13/25
87	Asphalt Striping	2 days	Thu 8/7/25	Fri 8/8/25
89	Clean up and Demob	2 days	Thu 8/14/25	Fri 8/15/25
88	Punchlist	10 days	Mon 8/18/25	Fri 8/29/25
57	**Field 3 - Turf Field Replacement - By Owner**	**45 days**	**Fri 8/2/24**	**Fri 10/4/24**
58	Mobilize, Fencing and Signage	2 days	Fri 8/2/24	Mon 8/5/24
59	Remove Existing Field Turf	10 days	Tue 8/6/24	Mon 8/19/24
60	Inspect/Prepare Subbase	3 days	Tue 8/20/24	Thu 8/22/24
61	Install New Field Turf	25 days	Fri 8/23/24	Fri 9/27/24
62	Punchlist and Clean Up	5 days	Mon 9/30/24	Fri 10/4/24
90	**Building Additions and Alterations**	**301 days**	**Thu 6/27/24**	**Fri 8/29/25**
91	**Security Vestibule Addition**	**197 days**	**Thu 6/27/24**	**Fri 4/4/25**
92	Mobilize, Fencing, Temp Partition Walls and Signage	10 days	Thu 6/27/24	Thu 7/11/24
93	Demo	10 days	Fri 7/12/24	Thu 7/25/24
94	Layout New Security Footprint	5 days	Fri 7/19/24	Thu 7/25/24
95	Excavate New Foundation	10 days	Fri 7/26/24	Thu 8/8/24
96	Form and Pour Concrete Foundations	15 days	Fri 8/2/24	Thu 8/22/24
97	Backfill and Make Safe for Crane	5 days	Fri 8/23/24	Thu 8/29/24
98	Structrural Steel	10 days	Fri 8/30/24	Fri 9/13/24
101	Underslab/ThruWall Rough Utilities	10 days	Mon 9/16/24	Fri 9/27/24
103	Concrete Slab on Grade	5 days	Mon 9/30/24	Fri 10/4/24

Brewster School District
High School Additions and Renovations Pacakge 1
Bid Schedule: Tue 4/16/24

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

ID	Task Name	Duration	Start	Finish
102	Masonry	20 days	Mon 10/7/24	Fri 11/1/24
99	Roofing	15 days	Mon 11/4/24	Fri 11/22/24
105	Windows and Exterior Doors	10 days	Mon 11/4/24	Fri 11/15/24
104	Site Finishes	20 days	Mon 11/18/24	Tue 12/17/24
106	Framing and Drywall	5 days	Mon 11/18/24	Fri 11/22/24
100	MEP Rough-In/Tie-In	20 days	Mon 11/25/24	Tue 12/24/24
107	Insulation	5 days	Thu 12/26/24	Wed 1/1/25
108	Painting	10 days	Thu 1/2/25	Wed 1/15/25
109	Flooring	5 days	Thu 1/16/25	Wed 1/22/25
110	Interior Doors and Hardware	10 days	Thu 1/23/25	Wed 2/5/25
111	Ceiling	5 days	Fri 2/7/25	Thu 2/13/25
112	MEP Finishes	10 days	Fri 2/14/25	Thu 2/27/25
113	MEP Commissioning	10 days	Fri 2/28/25	Thu 3/13/25
114	Punch list	20 days	Fri 2/28/25	Thu 3/27/25
115	Clean Up	5 days	Fri 3/28/25	Thu 4/3/25
116	Owner Occupancy	1 day	Fri 4/4/25	Fri 4/4/25
117	**Bridge Entrance Renovations**	**41 days**	**Thu 6/27/24**	**Fri 8/23/24**
118	Mobilize, Fencing and Signage	1 day	Thu 6/27/24	Thu 6/27/24
119	Demo Bridge	10 days	Fri 6/28/24	Fri 7/12/24
120	Re-Build Bridge	25 days	Mon 7/15/24	Fri 8/16/24
121	Clean up and Demobilize	5 days	Mon 8/19/24	Fri 8/23/24
122	**HVAC Upgrades**	**261 days**	**Fri 8/23/24**	**Fri 8/29/25**
123	Fabricate Mechanical Equipment	120 days	Fri 8/23/24	Wed 2/12/25
124	Mobilze, Fencing/Walls and Signage	1 day	Mon 6/30/25	Mon 6/30/25
125	MEP Make Safe for Demo	5 days	Mon 6/30/25	Mon 7/7/25
126	Demo Existing HVAC Units	15 days	Tue 7/8/25	Mon 7/28/25
127	MEP Rough-In	10 days	Tue 7/8/25	Mon 7/21/25
128	Set New Units	1 day	Tue 7/29/25	Tue 7/29/25
129	Connect New Mechanical Equipment	15 days	Wed 7/30/25	Tue 8/19/25
130	MEP Finishes	5 days	Wed 8/20/25	Tue 8/26/25
131	Clean up and Demobilize	5 days	Wed 8/20/25	Tue 8/26/25
132	Commission	8 days	Wed 8/20/25	Fri 8/29/25
133	**Elevator**	**261 days**	**Fri 8/23/24**	**Fri 8/29/25**
134	Fabricate Elevator	45 days	Fri 8/23/24	Fri 10/25/24
135	Mobilze, Fencing/Walls and Signage	1 day	Mon 6/30/25	Mon 6/30/25
136	MEP Make Safe and Prepare Elevator Demo	5 days	Mon 6/30/25	Mon 7/7/25
137	Renovate Elevator Machine Room	15 days	Tue 7/8/25	Mon 7/28/25
138	Demo Elevator	10 days	Tue 7/8/25	Mon 7/21/25
139	Prepare for New Sump Pump	1 day	Tue 7/22/25	Tue 7/22/25
140	MEP Rough-In	3 days	Wed 7/23/25	Fri 7/25/25
141	Install New Elevator	20 days	Mon 7/28/25	Fri 8/22/25
142	MEP Finishes	2 days	Thu 8/21/25	Fri 8/22/25
143	Clean up and Demobilize	5 days	Mon 8/25/25	Fri 8/29/25
144	Punchlist	5 days	Mon 8/25/25	Fri 8/29/25
145	Commission Elevator	5 days	Mon 8/25/25	Fri 8/29/25
146	**Closeout**	**89 days**	**Mon 8/18/25**	**Fri 12/19/25**
147	Site Work - O&M's/Trainings/Warranties/Final Payment	60 days	Mon 8/18/25	Mon 11/10/25
148	Building Work - O&M's/Trainings/Warranties/Final Payment	58 days	Tue 9/2/25	Thu 11/20/25
149	Substantial Completion Filing @ NYSED	21 days	Fri 11/21/25	Fri 12/19/25



Brewster School District
High School Additions and Renovations Pacakge 1
Bid Schedule: Tue 4/16/24

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual 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 - Form of Agreement: 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 00 7300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

D. Section 01 2100 - Allowances: Payment procedures relating to allowances.

E. Section 01 2300 - Alternates: Payment procedures relating to alternates.

F. 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% of contract amount)
5. Each allowance.
6. Each alternate.
7. Meeting attendance. ($500.00 per meeting. Min.,2 meetings per month)
8. As-built Drawings. (2% of contract amount)
9. Testing: HVAC balance reports (.05% of contract amount)
10. Testing: General Construction, Plumbing and Electrical (1% of contract amount.)
11. Punch List (1% of contract amount).
12. Final Cleaning
13. Closeout Documents (1% 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 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 the LFG Engineers.
   a. TOTAL COMMISSIONING ALLOWANCE .
      TWENTY THOUSAND_____ ($ 20,000.00) DOLLARS
      (INSERT ON HVAC BID FORM)

B. CONTIGENCY ALLOWANCES **- GC Contract #1**

1. GC-1 Asbestos Pipe Fitting Abatement:
   a. Description: Removal of additional asbestos containing pipe insulation fittings and installation of new insulation fittings in areas already under containment and not specifically indicated with bid documents.
      Unit of Measurement: Each
      Quantity: Ten: (10) fittings .
      Ten: (10) fittings @_____ per fittings:
      _____ ($_____) DOLLARS
2. GC- 2 Asbestos Pipe Insulation Abatement:
   a. Description: Removal of additional asbestos contain pipe insulation and installation of new insulation in areas already under containment and not specifically indicated in bid documents.
      Unit of Measurement: Linear Feet
      Quantity: Twenty: (20) linear feet .
      Twenty: (20) linear feet @_____ per linear feet:
      _____ ($_____) DOLLARS
3. GC- 3 Small Containment Area:
   a. Description: Construct and remove, at completion of work, a small containment area in accordance with Asbestos Abatement Removal specifications at areas not specifically identified in bid documents and removal and reinsulation of five (5) fittings and ten (10) lineal feet of asbestos containing piping insulation.
      Unit of Measurement: Each
      Quantity: One.
      One containment area @_____ :
      _____ ($_____) DOLLARS

TOTAL CONTINGENCY ALLOWANCE - **CONTRACT #1 (INSERT ON GC BID FORM)**
_____ ($_____) DOLLARS

C. CONTINGENCY ALLOWANCES - **SC Contract #5**

1. SC- 1Removal 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. SC-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. SC- 3 New Engineered Fill:
   a. Description: Provide new engineered fill.
      Unit of Measurement: Cubic Yard
      Quantity: One hundred cubic yards
      one hundred cubic yards @_$_____ per each yard:
      _____ ($_____) DOLLARS

4. SC- 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

5. SC - 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

6. SC-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

7. SC-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

TOTAL CONTINGENCY ALLOWANCES **CONTRACT #5 - (INSERT ON SC BID FORM)**

_____
_____ ( ) DOLLARS

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 Bid Form for listing amount of each alternate.

C. Document 00 5200 - Form of Agreement: 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

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 rebuild the existing bridge abutments in accordance with specifications and as shown on the contract drawings.

1.6 SCHEDULE OF ALTERNATES - CONTRACT #5, SITE

A. Alternate S-1

1. The Contractor for Contract #5 SITE work shall state the amount to be ADDED TO the Base Bid to providefurnish and install all labor, equipment and material required to construct a new Parking Lot C at Foggintown Road.in accordance with specifications and as shown on the contract drawings.

B. Alternate: S-2

1. The Contractor for Contract #5 SITE shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all labor, equipment and material required to construct concrete pad for relocated Bleachers at Field #8 in accordance with specifications and as shown on the contract drawings.

C. Alternate: S-3

1. The Contractor for Contract #5 SITE shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all labor, equipment and material required to remove existing asphalt pad and sub base and to restore area in accordance with specifications and as shown on the contract drawings.

D. Alternate SC-4

1. The Contractor for [Contract #5 SITE] shall state the amount to be ADDED TO the Base Bid to provide, furnish and install all labor, equipment and material required to provide asphalt paving as indicated on the drawings.

1.7 SCHEDULE OF ALTERNATES - CONTRACT #6, ELEVATOR MODIFICATION

A. Alternate ELEV-1

1. The Contractor for Elevator Modifications shall state the amount TO BE added to the Base Bid to provide a Two Year Service Contract in accordance with the specifications.

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 2200 - Unit Prices, for additional unit price requirements.

C. Section 01 2300 - Alternates, for product alternatives affecting this section.

D. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

E. Section 01 6000 - Product Requirements: Fundamental product requirements, definitions for substitutions, product options, delivery, storage, and handling and restrictions on timing of substitution requests.

F. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.4 DEFINITIONS

A. Refer to Section 01 6000 - Product Requirements.

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 Architect and Construction Manager for review or redesign services associated with re-approval by authorities.
7. Statement indicating why specified material or product cannot be provided.
8. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
9. 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.
10. Samples, where applicable or requested.

11. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
12. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
13. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
14. 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.
15. Cost information, including a proposal of change, if any, in the Contract Sum.
16. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
17. 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. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
   2. 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.

D. Limit each request to a single proposed substitution item.

1. Submit an electronic document, combining the request form with supporting data into single document.
2. 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 30 days after date of Agreement.

C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

D. Substitutions will not be considered under one or more of the following circumstances:

1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.3 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 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

3.6 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: BHS Security Vestibule, Synthetic Fields & Related Work

Substitution Request Number: _____

From: _____

Date: _____

A/E Project Number: 23505.01

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.

Local support and availability will be available for proposed substitution.

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.

____ Additional information requested.

By:_____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. Progress photographs.

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 and Owner's occupancy, .

C. Section 01 1010 - Milestone Schedule.

D. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

E. Section 01 3553 - Site Safety and Security Procedures.

F. Section 01 5000 - Temporary Facilities and Controls.

G. Section 01 6000 - Product Requirements: General product requirements.

H. Section 01 7000 - Execution: Additional coordination requirements.

I. Section 01 7800 - Closeout Submittals.

1.4 REFERENCE STANDARDS

A. Submittal Cover Sheet: Attached at the end of this section.

1.5 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Conform to 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 Construction Manager's.
   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 are to 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. Cost: The cost of the service is to be paid by each contractor ; include the cost of the service in the contract sum.

C. Submittal Service: The selected service is:
   1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.

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 staring 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 days 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. Contractor.

2. Brewster Central School District.
3. Architect
4. Construction Manager
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 COORDIATION 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,, Plumbing, 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 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.

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 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Construction Manager and Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.
   4. Structural framing in progress and upon completion.
   5. Enclosure of building, upon completion.
   6. Final completion, minimum of ten (10) photos.

E. Take photographs as evidence of existing project conditions.

F. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   2. Consult with Architect for instructions on views required.
   3. Provide factual presentation.

4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Via email.
2. File Naming: Include project identification, date and time of view, and view identification.
3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.10 COORDINATION

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.

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 to ensure roofing warranty is maintained.

C. Coordination Items:
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. All valves, dampers (fire, smoke, volume, and automatic), coils, humidifiers, smoke detectors, etc. requiring access for service and maintenance.
5. All registers, grilles, diffusers, radiators and convectors, and other terminal elements.
6. All access doors.
7. 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

3.11 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the 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.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
      a. The Brewster Central School District reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Brewster Central School District's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. Highlight items for which a timely response has not been received to date.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. 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.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.12 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) days after award of contract.

D. All Shop Drawing Submittals shall be submitted no later than twenty (20) days after Letter of Award of Contract. No further payments will be made to the contractor after twenty (20) 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. Design mix formulas.
   7. 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.
   1. Submittals for HVAC, plumbing, electrical, or structural submit directly to consultant with copy to Architect and Construction Manager.

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. Color chip samples for all materials where color selection is required shall be actual color chips. Electronic copies are not acceptable.

I. After review, provide copies and distribute in accordance with Submittal Procedures article below .

J. 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.

K. 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.

L. **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.**

M. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

N. 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. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. 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 Revl.pdf 07 5323 Bond AdhRevl.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 the Contract Documents and coordinating related work.
2. Do not reproduce the 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

BHS Security Vestibule, Synthetic Fields & Related Work

Brewster High School

ARCHITECT:	**CONSTRUCTION MANAGER:**	**OWNER:**
Architect: Fuller Dangelo District :BCSD	**Triton Construction**	**Brewster Central School**
45 Knollwood Rd.	**1279 Rt 300 1st fl. Newburgh, NY 12550**	**30 Farm To Market Road.**
Elmsford, NY		**Brewster, NY 10509**

CONTRACTOR: _____ CONTRACT: _____

ADDRESS: _____

TELEPHONE: _____FAX: _____EMAIL: _____

Facility Name: Brewster High 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.

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. Each prime Contractor shall coordinate their work with work of all prime contracts.

D. 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.

E. 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 additional Schedule when project falls 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 CPM or 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, 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. By responsibility in order of earliest possible start date.

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.

C. The time difference between the Early Finish date and the Late Finish Date is defined as "float." The "float" belongs to the Project and may be used by the Owner, Construction Manager, and prime contractors to benefit the Project. Changes or delays that influence activities in the network with "float" and do not extend the Critical Path (the network of activities with zero days "float") shall not be justification for an adjustment in Contract time for performance.

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.

B. 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: 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.
2. Off-Gassing Control. 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.

1.8 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 Contractor 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. Each 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 Construction Manager 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 Construction Manager and Brewster Central School District and security forces thru the Construction Manager.

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 Construction Manager.
    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 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.
    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 Construction Manager.
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 Construction Manager.
5. If, upon notification by Owner's Representative, and the 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.
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 Construction Manager.
7. Withholding of Payment
    a. 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 Architect/Engineer.

b. 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.

c. In addition, for each calendar day or part thereof of any unsatisfactory work violating the required provisions of any subsection under Traffic Control, liquidated damages will be assessed as listed in the General Conditions.

d. If General Construction 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(s). The cost of this work shall be in addition to the liquidated damages and nonpayment for Traffic Control listed above.

e. However, where major nonconformance 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 Construction Manager regardless of whether corrections are made by the Construction Manager as stated in the paragraph above

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. 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.

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 Construction Manager 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. 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. 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. 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. Each Contractor 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. 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. The 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.

B. 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.

C. 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

D. 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.

E. 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.

F. Each Contractor shall follow all rules and regulations put forth in the Code of Federal Regulations (OSHA Safety and Health Standards).

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# 2023012089

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. Control of installation.

E. Mock-ups.

F. Manufacturers' field services.

G. 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 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 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 , Construction Manager, and Contractor'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.

1.6 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.

1.7 REFERENCES AND STANDARDS - See Section 01 4219

1.8 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 or 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, construct mock-ups in location and size indicated 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 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 Owner's Representative, Contractor, and Architect of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Owner's Representative, Contractor, and Architect
   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.

3.4 OWNER'S TESTING AND INSPECTIONS

A. Coordinate with Architect and 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. Asbestos inspection and air monitoring
2. Soil bearing capacity and bottom of footings.
3. Compaction and backfilling.
4. Compaction of structural fill.
5. Wall footings and pier footing reinforcing, size and placement.
6. Foundation wall reinforcing and placement.
7. Slab on grade thickness and reinforcing placement.
8. Concrete samples and compression tests.
9. Mortar sampling and testing.
10. Placement of joint reinforcement.
11. Placement of anchors.
12. Placement of concealed flashing.
13. Cast stone anchors.
14. Placement of cavity insulation.
15. Placement of cavity drainage material.
16. Placement of weep holes.
17. Structural steel column, beam and miscellaneous framing members..
18. Field bolts & welded connections.
19. Shop fabrication and welding.
20. Welder's certificates.
21. Steel studs.
22. Placement and type of metal deck.
23. Attachment of deck to steel.
24. Pour stops and framed openings.
25. Testing of shear studs.
26. Size, placement and fasteners of light gauge metal framing.
27. Exterior wall system including metal framing fasteners, gypsum sheathing, vapor barrier, masonry, insulation
28. Aluminum windows connections and fasteners.

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.

3.5 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.

3.6 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.

3.7 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 Amendment (2020).

H. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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. Section 02 2080 - Asbestos Abatement.

D. Division 22 - Plumbing.

Division 23 - Heating, Ventilation and Air Conditioning.

Division 26 - Electrical.

E. Division 31 - Earthwork.

F. Division 32 - Exterior Improvements

G. 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 .

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 CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. 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 (Reapproved 2021).

3.3 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS

3.4 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL

A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Concrete Construction; 2020.

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; 2020.

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 (Reapproved 2021).

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 A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2016.

D. ANSI A224.1 - American National Standard Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1990.

E. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

F. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2019.

G. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

H. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

I. 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.

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 Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices ; 2019, with Errata (2021).

3.9 ASTM A Series -- ASTM INTERNATIONAL

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 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 A526/A526M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality; 1990.

G. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2021a.

H. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2021a.

I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

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 A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

L. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

M. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

N. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

O. 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.

P. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

3.10 ASTM G Series -- ASTM INTERNATIONAL

A. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

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.

3.12 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/.

3.13 IAAF -- INTERNATIONAL AMATEUR ATHLETIC FEDERATION

3.14 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 Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

3.15 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

A. NFPA 1 - Fire Code; 2021, with Amendment (2020).

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

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; 2019.

E. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

3.16 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION

A. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

3.17 PCI -- PRECAST/PRESTRESSED CONCRETE INSTITUTE

A. PCI MNL-123 - Connections Manual: Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.

3.18 SMACNA -- SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.

A. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

3.19 STC -- SYNTHETIC TURF COUNCIL

A. STC (GCRI) - Guidelines for Crumb Rubber Infill Used in Synthetic Turf Fields; 2010, Revised (2014).

B. STC (SGEE) - Suggested Guidelines for the Essential Elements of Synthetic Turf Systems; 2011.

END OF SECTION

SECTION 01 4534
CODE REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the New York State Uniform Code (NYSUC).

1.2 DEFINITIONS

A. Registered Design Professional: Licensed Professional Engineer or Registered Architect whose seal appears in the Construction Drawings. Unless noted otherwise, references to the Registered Design Professional in this section refer to the Structural Engineer for building design.

B. RDP for Geotechnical Engineering: Licensed Professional Engineer whose seal appears on the Geotechnical Investigation. The RDP for Geotechnical Engineering shall perform or oversee Agent 2 services as indicated in the Schedule of Special Inspections. If a Geotechnical Investigation was not performed or if the RDP for Geotechnical Engineering is not retained to perform Agent 2 services, a licensed Geotechnical Engineer shall be retained to perform these duties.

C. Code Enforcement Official: Officer or other designated authority charged with administration and enforcement of the NYSUC. For projects under jurisdiction of New York State agencies such as the Department of Education (SED), State University Construction Fund (SUCF), Office of General Services (OGS), and Dormitory Authority (DASNY), the Code Enforcement Official is an official from agency having jurisdiction.

D. Special Inspector (SI): Professional Engineer licensed in the State of New York, acting on behalf of the Owner, that implements the Special Inspection Program for the project.

E. Testing/Inspecting Agency: Agent retained by Special Inspector or Owner and coordinated by Special Inspector to perform some inspection services on behalf of Special Inspector.

F. 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.

G. 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.

H. 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.

I. Statement of Special Inspections: Documents prepared by the Registered Design Professional and filed with and approved by the Code Enforcement Official as a condition of obtaining a building permit. These documents include this specification and the Schedule of Special Inspections.

J. 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. The Schedule of Special Inspections is located in Drawing S003.

K. Inspect and Inspection: Visual observation of materials, equipment, or construction work as defined in the Statement of Special Inspections, to determine that the work is in substantial conformance with the requirements of the Contract Documents.

L. Continuous Special Inspection: Full-time observation of work by the Special Inspector or Testing Agency while the work is being performed.

M. 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.

1.3 QUALIFICATIONS

A. Special Inspector and Testing/Inspecting Agency shall be accepted by the Registered Design Professional (RDP) and the Code Enforcement Official.

B. Special Inspections shall be performed by agents who have relevant experience for each category of inspections indicated in the drawings.

C. Minimum qualifications of inspection agents are indicated in the drawings.

1.4 SUBMITTALS

A. Special Inspector and Testing/Inspecting Agency shall submit to the Registered Design Professional and Code Enforcement Official for review, a copy of their qualifications including names and qualifications of each inspector and technician who will be performing inspections or tests.

B. Special Inspector and Testing/Inspecting Agency shall disclose past or current business relationship or potential conflict of interest with Contractor or Subcontractors whose work will be inspected or tested.

1.5 PAYMENT

A. Owner will engage and pay for services of Special Inspector and Testing/Inspecting Agency.

B. If materials requiring Special Inspections are fabricated in a plant not within 200 miles of project site, Contractor shall be responsible for travel expenses of Special Inspector or Testing/Inspecting Agency.

C. Contractor shall be responsible for cost of retesting or reinspection of work failing to comply with requirements of Contract Documents.

1.6 OWNER RESPONSIBILITIES

A. Owner will provide Special Inspector with complete set of Contract Documents sealed by the Registered Design Professional and approved by the Code Enforcement Official.

1.7 CONTRACTOR RESPONSIBILITIES

A. Contractor shall cooperate with Special Inspector and his agents so Special Inspections and testing may be performed without hindrance.

B. As indicated in the Schedule of Special Inspections, Contractor shall notify Special Inspector or Testing/Inspecting Agency at least 48 hours in advance of a required inspection or test.

C. Contractor shall provide incidental labor and facilities to provide access to work to be inspected or tested, to obtain and handle samples at site or at source of products to be tested, to facilitate tests and inspections, and for storing and curing of test samples.

D. If Special Inspections or testing require the use of Contractor's scaffolding to access work areas, Contractor shall provide competent person to perform daily evaluation of scaffolding to verify it is safe to use. Contractor shall notify Special Inspector and Testing Agent of this review before each use. Contractor is responsible for safe assembly and stability of scaffolding.

E. Contractor shall keep latest set of Construction Drawings, field sketches, accepted shop drawings, and specifications at project site for field use by Inspectors and Testing Technicians.

F. Contractor shall perform remedial work if required and sign nonconformance reports stating remedial work has been completed. Contractor shall submit signed reports to Special Inspector as work proceeds.

G. The Special Inspection program shall not relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents or from implementing an effective Quality Control program.

H. Contractor shall be solely responsible for construction site safety.

1.8 SPECIAL INSPECTOR RESPONSIBILITIES

A. Special Inspector shall hold a Special Inspections preconstruction meeting at least 7 days prior to initial planned date for start of construction. Attendees shall include Contractors, Owner's Representative, Testing Agency, Special Inspector, and Registered Design Professionals for Structural Engineering and for Architecture. Discussions shall include the following:

1. Review of specifications and Schedule of Special Inspections for work requiring Special Inspections.
2. Responsibilities of Contractors, Owner, Testing Agency, Special Inspector, and Registered Design Professional.
3. Notification and reporting procedures.

B. Special Inspector shall record and distribute minutes from the Special Inspection Preconstruction meeting.

C. Special Inspector shall review inspection and material testing reports and coordinate the services of the Testing/Inspecting Agencies as follows:
1. Verify inspections have been performed in accordance with the Schedule of Special Inspections.
2. Verify reports are being distributed to the Contractor, Owner, Architect, Code Enforcement Official, and Registered Design Professional (RDP) for Structural Engineering.
3. Verify discrepancies have been recorded and are being tracked.

D. Special Inspector shall make site visits to inspect work as designated in the Statement of Special Inspections. Discrepancies will be brought to the attention of the Contractor and RDP.

E. Special Inspector shall keep records of inspections and tests.

F. Special Inspector shall review Certificates of Compliance for conformance with the standards specified in the Contract Documents. Discrepancies will be brought to the attention of the Contractor and RDP.

G. Special Inspector shall submit a final report of Special Inspections in accordance with Section 1.3 of this specification.

1.9 LIMITS ON AUTHORITY

A. Special Inspector or Testing/Inspecting Agency shall not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Special Inspector or Testing/Inspecting Agency shall not have control over Contractor’s means and methods of construction.

C. Special Inspector or Testing/Inspecting Agency shall not be responsible for construction site safety.

D. Special Inspector or Testing/Inspecting Agency shall not have authority to stop work.

PART 2 INSPECTIONS AND TESTING

2.1 EXCAVATION, BACKFILL, COMPACTION, AND DEEP FOUNDATIONS (BUILDING AREA)

A. Special Inspector shall perform inspections and verifications or coordinate the RDP for Geotechnical Engineering to perform inspections and verifications including the following:
1. Identify soils requiring undercutting and replacing while observing proof rolling and when subgrade is exposed.
2. Verify footing bearing strata.
3. 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 Project Geotechnical and Subsurface Investigation.
4. Observe and accept filling and compaction procedures.
5. 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. Footing subgrade and each stratum of soil on which footings will be placed.
2. Building subgrade including slab subbase and each lift of compacted material.
3. Inspect each subgrade and fill layer before further backfill or construction work is performed. Approval shall be based on satisfactory achievement of compaction criteria.
4. Verify use of fill material and lift thicknesses in field.

C. Testing Agency shall perform moisture content testing of slab subbase in accordance with ASTM D 6938.

2.2 CAST-IN-PLACE CONCRETE

A. Special Inspector shall perform the following:
   1. Inspect reinforcing steel and placement.
      a. Inspect embedded bolts and anchor rods prior to concrete placement.

B. Testing Agency shall perform the following:
   1. Verify use of required design mix.
   2. 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 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.
      f. 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.
      g. Record air temperature and general weather conditions (cloudy, windy, sunny, etc.).
      h. 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.
      i. Perform concrete compressive tests as follows:
         a) Prepare compressive test specimens in accordance with ASTM C 31. Take a set of six 6 x 12 cylinders or nine 4 x 8 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: two 6 x 12 specimens (three 4 x 8 specimens) tested at 7 days, two 6 x 12 specimens (three 4 x 8 specimens) tested at 28 days, and two 6 x 12 specimens (three 4 x 8 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 specimens (six 4 x 8 specimens) for each 50 cubic yards or fraction thereof of supporting foundation concrete. Field-cure cylinders, and test two 6 x 12 specimens (three 4 x 8 specimens) at 7 days, retaining two 6 x 12 specimens (three 4 x 8 specimens) for later testing if required. Steel erection may not begin until supporting concrete obtains 75 percent of its design strength.
         c) If concrete will be placed in separate buildings on a given project, make individual compressive strength test cylinders for each building.
      j. Perform additional testing as follows if required:
         a) Take additional set of cylinders for compressive strength testing for each truck in which total time period between batching and completing placement has exceeded ACI-recommended, 90-minute-maximum time limit. Take additional cylinders within 10 minutes of placement completion.

b) Make additional tests of in-place concrete when test results indicate specified concrete strengths or other characteristics have not been attained in structure.
c) Perform tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods acceptable to Architect.
d) Contractor shall reimburse Owner for cost of additional tests.

k. Inspect concrete placement for proper application techniques.
l. Inspect for maintenance of specified curing temperature and techniques.
m. Perform floor flatness (FF) and levelness (FL) testing of slabs receiving a trowel finish no later than 48 hours after slab placement in accordance with ASTM E 1155.
a) Each floor/level shall be divided into test section areas. FF and FL numbers for each test section area are local values.
b) Test section areas shall be minimum of 320 square feet with minimum boundary length of 8 feet for any side. Testing is not to be performed for smaller slab areas.
c) Test section areas shall be maximum of 2,000 square feet.
d) Test section areas shall not cross slab construction joints.
e) Locate test lines orthogonally or at 45 degrees to slab edges in accordance with ASTM E 1155 and no closer than 2 feet to any edge or opening.
f) Overall FF and FL numbers are for entire floor/level and shall be determined by considering measurements from all of test section areas on that floor/level.
g) (FL) testing is not required for slabs on metal deck.
n. 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.
o. Inspect welding of reinforcing bars.

2.3 UNIT MASONRY

A. Special Inspector shall perform the following:
1. As masonry construction begins, the following shall be verified to ensure compliance:
a. Construction of mortar joints.
b. Location of joint reinforcement and connectors.
c. Verify:
a) Size and location of structural elements.
b) Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.
c) Specified size, grade, and type of reinforcement.
d) Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).
d. Prior to grouting, verify:
a) Grout space is clean.
b) Placement of reinforcement and connectors.
c) Construction of mortar joints.
e. Verify grout placement to ensure compliance with code and Construction Document provisions.
a) Grouting of CMU cells.

B. Testing Agency shall perform the following:
1. Verify for compliance with approved submittals:
a. Proportions of site-prepared mortar.

b. Proportions of site-prepared grout.
c. Inspect:
   a) Welding of reinforcing bars.
d. 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.
   c) For each type of wall construction indicated, test masonry prisms in accordance with ASTM C 1314 and as follows:
   d) Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

2.4 STRUCTURAL STEEL (INCLUDING STEEL JOISTS AND METAL DECK)

A. 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.
   2. If Fabricator is designated as AISC-Certified Fabricator, Special Inspection for shop-fabricated members and assemblies is not required.
   3. 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.
      a. Review manufacturer's Certificates of Compliance for high-strength bolts and weld filler material.
      b. Review certified mill test reports.
      c. Inspect steel frame joint details for compliance with approved Construction Documents.
      d. Inspect end connections and bridging of open-web steel joists and joist girders.

B. Testing Agency shall perform the following:
   1. Material verification of high-strength bolts, nuts, and washers, including review of identification markings and manufacturer's Certificate of Compliance.
      a. Test high-strength bolt assemblies in a tension measuring device to verify material conformance prior to installation. Assemble bolt, nut, and washer on a loose plate and tension by tightening nut to develop required tension in Table 4 of "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
   2. Verification that copies of accepted field welding procedure specifications are available on site for reference by erector's welders.
   3. Verification that erector's welder's qualifications are current and appropriate for joint type, welding position, and welding process to be used.
   4. Verification that joint fit-up for partial and complete penetration groove welds are in compliance with AWS tolerances as follows:
      a. Visually inspect 50 percent of joints scheduled for partial and complete penetration groove welds.
      b. Visually inspect 50 percent of column splices scheduled for partial and complete penetration groove welds.
      c. Visually inspect 100 percent of tension member splices, column splices, and moment connections that are part of the lateral force resisting system.
   5. Inspect high-strength bolting.
      a. Joints designated as snug tight require only visual inspection.
      b. Joints designated as fully tensioned or slip critical require visual inspection during installation.
      c. Checking after installation using calibrated wrenches will not be permitted.

6. Material verification of structural steel and metal deck, including review of identification markings.
7. Perform pull-out tests on adhesive, expansion, and sleeve anchors.
8. Material verification of weld filler materials, including review of identification markings.
9. Inspect welding of structural steel and metal deck.
    a. Visually inspect welds according to AWS.
    b. Schedule inspection of field welding in timely manner utilizing vertical access means and methods utilized by Contractor to perform the welding.
    c. Ultrasonic inspection (UT) according to ASTM E 587 is required for partial and complete penetration field groove welds as follows:
        a) UT inspect 50 percent of joints scheduled for partial and complete penetration groove welds.
        b) UT inspect 50 percent of column splices scheduled for partial and complete penetration groove welds.
        c) UT inspect 100 percent of tension member splices, column splices, and moment connections that are part of lateral force resisting system.
        d) UT inspect 50 percent or minimum of six of the joints scheduled for partial or complete penetration groove welds completed by each welder. Increase inspection percentage to 100 percent for each welder with more than one rejected weld.
    d. Magnetic particle inspection according to ASTM E 709 is required for Fabricators not certified by AISC Quality Certification Program for 10 percent of shop fillet welds.
    e. Magnetic particle inspection according to ASTM E 709 is required for 10 percent of field fillet welds.
    f. UT inspect according to ASTM E 587 is required for 10 percent of shop partial or complete penetration welds and 100 percent of shop partial or complete penetration groove welds in tension members.
    g. Inspect shear connectors in accordance with AWS D1.1, Section 7. Observe bend tests performed by Contractor. Refer to Section 053000, Part 3 for bend test requirements.
    h. Inspect every shear connector by striking once with 10-pound hammer. Direction of hammer swing shall be parallel with member containing connector. Inspection by striking with hammer does not replace bend tests in accordance with AWS.
10. Inspect welding of reinforcing steel.
11. Inspect condition of erected materials.
    a. Visually inspect erected steel for damage.
    b. Visually inspect connections and framing to verify compliance with Contract Documents and accepted shop drawings.
12. Inspect column plumbness and splices:
    a. Inspect erected columns for plumbness within tolerances specified in Section 051200, Part 3: Execution.
    b. Inspect columns for fit up within tolerances specified in AISC Manual of Steel Construction, Specification Section M4.
13. Inspect mechanical fasteners for metal deck, including connections to supporting structure and side-lap fastening.
    a. Visually inspect 100 percent of mechanical deck fasteners and 50 percent using depth gauge tool provided by fastener manufacturer.
14. Additional testing shall be performed as follows if required.
    a. Testing Agency shall perform additional tests of connections and framing members field modified by Contractor to correct errors in shop drawings, fabrication, or erection.

b. Anchor rods and embedded structural supports incorrectly located or damaged after installation shall be field modified by Contractor as indicated in Section 033000, Paragraph 3.4 and tested by Testing Agency.

c. Testing and reporting of field modifications shall be in accordance with this section, Special Inspections, and have the following additional requirements:

a) Magnetic particle inspection according to ASTM E 709 is required for 100 percent of fillet welds.

b) Ultrasonic inspection according to ASTM E 587 is required for 100 percent of full-penetration welds.

c) Perform pull-out tests on 100 percent of each type of adhesive, expansion, or sleeve anchor used by applying a load equal to 125 percent of allowable pull-out strength listed in manufacturer's literature.

d. Contractor shall reimburse Owner for cost of additional tests performed.

2.5 COLD-FORMED METAL FRAMING

A. Special Inspector shall perform the following:

1. Verify Fabricator maintains detailed fabrication and Quality Control procedures:
   a. For Fabricators not previously registered and approved to perform such work without Special Inspection, review Quality Control procedures for completeness and adequacy relative to code requirements for Fabricator's scope of work.
2. Visually inspect installation of clips, hangers, hurricane ties, and miscellaneous connectors.
3. Visually inspect framing and details.

B. Testing Agent shall perform the following:

1. Verify member size and thickness.
2. Verify weight of galvanized coating according to ASTM A 90.
3. Visually inspect framing for damage.
4. Visually inspect welds according to AWS.
5. Perform pull-out tests on adhesive, expansion, and sleeve anchors.

2.6 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.

2.7 SPECIAL INSPECTIONS FOR SMOKE CONTROL

A. Test smoke control systems as follows:

1. Record device locations and test system for leakage after erection of ductwork but before starting construction that conceals or blocks access to system.
2. Test and record pressure difference, flow measurements, detection function and controls after system is complete and before structure is occupied.

PART 3 DOCUMENTATION

3.1 RECORDS AND REPORTS

A. Prepare detailed reports of each test or inspection. Include the following general information:

1. Project name and number.
2. Date of test or inspection.
3. Name of Testing Agency or Inspecting Agency.
4. Name of technician or inspector.
5. Weather conditions.
6. Locations and elevations of specific areas tested or inspected referenced to grid lines.
7. Description of test or inspection.

8. Reference to applicable ASTM standard.
9. Summary of observations, results, and recommendations.
10. Description of areas or materials requiring retesting or reinspection.

B. Concrete compressive strength test reports shall contain the following information:
1. Name of Contractor and concrete supplier.
2. Name of concrete testing service.
3. Name of technician making and testing specimens.
4. Truck number and delivery ticket number.
5. Date and location within structure of concrete placement.
6. Concrete type, class, mix proportions of materials, and design compressive strength at 28 days.
7. Slump, air content, unit weight, and concrete temperature.
8. Total time period between batching and completing placement for each truck.
9. Compressive strength and type of break for tests.

C. Field reports for concrete inspection shall contain general information noted above plus ambient temperature and cylinder numbers.

D. Test reports for masonry materials shall include proportions, composition, and compressive strength.

3.2 COMMUNICATION

A. Testing/Inspecting Agency shall immediately notify Contractor, Special Inspector, and Registered Design Professional by telephone, fax, or e-mail of test results failing to comply with requirements of Contract Documents.

B. Special Inspector shall immediately notify Contractor of work found to be in nonconformance with Contract Documents during inspections. If nonconforming work is not corrected while Special Inspector is on-site, Special Inspector shall notify Registered Design Professional within 24 hours (one business day) and issue an inspection report noting the non-conformance.

C. Special Inspector and each Testing/Inspecting Agent shall use a log to record and track non-conforming work during construction. Non-Conformance log shall include the following information:
1. Description of non-conformance.
2. Date of non-conformance.
3. Description of RDP response if received.
4. Status of nonconformance: ‘Open’ or ‘Closed.’

D. Updated log shall be attached to each inspection report. Special Inspector or Testing/Inspecting Agent may use Non-Conformance Log form provided at end of this section or other similar form.

E. If non-conforming work is not corrected at time of substantial completion of structure or other appropriate time, Special Inspector shall notify Code Enforcement Official.

3.3 DISTRIBUTION OF REPORTS

A. Testing/Inspecting Agency shall submit reports to Special Inspector and Registered Design Professional within 7 days of inspection or test. Legible handwritten reports may be submitted if final typed copies are not available.

B. Special Inspector shall distribute reports to the Contractor, Owner, Architect, Code Enforcement Official, and RDP for Structural Engineering within 7 days of inspections. Legible handwritten reports may be submitted if final typed copies are not available.

C. If requested by the Code Enforcement Official, Special Inspector shall submit interim reports that include inspections and tests performed since beginning of construction or since previous interim report. Interim reports shall be addressed to the Code Enforcement Official with copies sent to the Registered Design Professionals (Structural Engineer and Architect) and Contractor. Interim reports shall be signed by Agent performing inspections.

3.4 FINAL REPORT OF SPECIAL INSPECTIONS

A. At completion of work, each Testing/Inspecting Agency shall submit Agent's Final Report of Special Inspections to Special Inspector stating work was completed in substantial conformance with Contract Documents and appropriate inspections and tests were performed. Testing/Inspecting Agency may use Agent's Final Report of Special Inspections form provided at end of this section or other similar form.

B. At completion of work, Special Inspector shall compile a Final Report of Special Inspections including each Agent's Final Report of Special Inspections. The Final Report of Special Inspections shall state required inspections have been performed and itemize nonconforming work not corrected or resolved as required by the NYSUC. Interim reports from all Agents will not be included unless specifically requested by the Owner or Code Enforcement Official. The Final Report shall be stamped by a New York State Professional Engineer.

C. Special Inspector may use Final Report of Special Inspections form provided at end of this section or other similar form based on CASE Form 102-2001.

D. Special Inspector shall submit Final Report of Special Inspections to Registered Design Professional and Code Enforcement Official prior to issuance of a Certificate of Use and Occupancy.

Testing/Inspection Agent's Final Report of Special Inspections

Project Name: _____ Inspection Agent: _____

Location: _____ Inspection Agent Project No.: _____

Owner: _____Special Inspector:_____

Owner Address: _____ Structural RDP: _____

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

TITLE _____

_____

(Type or print name)

_____ _____

Signature Date

_____

Address

_____

City, State, Zip Design Professional Seal or Certification

Testing/Inspection Agent's Final Report of Special Inspections

Project Name: _____ Inspection Agent: _____

Location: _____ Inspection Agent Project No.: _____

Owner: _____Special Inspector:_____

Owner Address: _____ Structural RDP: _____

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

TITLE _____

_____

(Type or print name)

_____ _____

Signature Date

_____

Address

_____

City, State, Zip Design Professional Seal or Certification

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 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. Storm and sanitary sewer.
F. Temporary electric power and light.
G. Temporary heat.
H. Ventilation.
I. Temporary sanitary facilities.
J. Temporary Controls: Barriers, enclosures, and fencing.
K. Storage shed
L. Temporary enclosures.
M. Waste removal facilities and services.
N. Field offices.
O. Temporary fire protection
P. Enclosure fence for the construction site.
Q. Environmental protection.
R. Temporary Roads
S. Staging Area
T. Barricade Warning Signs & Lights
U. Temporary Partitions
V. Covered Walkways
W. Dewatering general construction related excavations
X. Snow Removal.

1.3 RELATED REQUIREMENTS

A. Section 01 3553 - Site Safety and Security Procedures
B. Section 01300 for submittals.
C. Section 01700 for progress cleaning requirements.
D. Section 01 5100 - Temporary Utilities.
E. Section 01 5213 - Field Offices and Sheds.
F. Section 01 5500 - Vehicular Access and Parking.
G. Section 01 3553 - Site Safety and Security Procedures.
H. Section 01 5813 - Temporary Project Signage.

1.4 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

B. Maintain temporary facilities in operable condition.

1.5 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures

1.6 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.

1.7 Site Plan: Show exiting fencing, temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.8 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.

1.9 QUALITY ASSURANCE

A. Regulations: The contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
   1. Building code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Police, fire department and rescue squad rules.
   5. Environmental protection regulations

B. Standards: The 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.

1.10 PROJECT CONDITIONS

A. General: The 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 prime 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 Owner, Owner’s representative and Architect/Engineer, 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 Owner'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 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.

E. Security and Protection: Maintain site security and protection facilities in a safe, lawful, publicly acceptable manner. Take measures necessary to prevent site erosion.

1.11 TEMPORARY UTILITIES

A. Brewster Central School District will provide the following:
   1. Electrical power, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. Existing facilities may be used.

C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

D. 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.

1.12 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.
   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 unit ventilators, heaters, fans, light fixtures, and elevator components and other equipment items shall be legally disposed of off-site by the contractor removing the item.Do not dispose of in the GC provided container.
   10. Collection of general waste and debris and disposing into containers provided by General Construction.for all other contractors except for the Site Contractor who shall provide their own container.
   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.

13. First Aid Station and Supplies

1.13 GENERAL CONSTRUCTION CONTRACTOR, CONTRACT #1

A. The General Construction Contractor is responsible and pays all costs for all prime contractors except for for the SITE Contractor (who shall be responsible for their own temorary facilities) the following:

1. Temporary toilets, including disposable supplies.
2. Temporary wash facilities, including disposable supplies.
3. Temporary daily janitorial services.
4. Temporary heat.
5. First Aid Station and Supplies.
6. Containers for non-hazardous waste and debris. (Not including Site contractor debris)
7. Temporary enclosure of the building.
8. Disposal of wastes containers.
9. Rodent and pest control.
10. Barricades, warning signs, and lights.
11. Sidewalk bridge and fence.
12. Security enclosure and lockup.
13. Environmental protection.
14. Temporary erosion and sediment control
15. Temporary Fire Protection
16. Temporary Protection for existing flooring, from altered areas to exits.
17. Construction aids and miscellaneous services and facilities.
18. Temporary dustproof partitions/controls.
19. Dewatering
20. Snow Removal.

1.14 PLUMBING CONTRACTOR, CONTRACT #2

A. Temporary Water Service: Plumbing Contractor shall provide and pay all costs to install distribution piping of sizes and pressures adequate for construction .

1. Provide and maintain a temporary water system of size and capacity as required below to supply the needs of all contractors for the work.
2. Provide no less than two 3/4 inch hose bibs conveniently located at work areas.
3. Install such temporary water system so that service shall be available at the commencement of the work. The permanent services shall be turned over to the Owner in perfect condition. Any repairs required due to temporary use shall be made at the sole expense of the plumbing contractor.
4. Protect temporary and permanent lines against any damage.
5. Remove all temporary lines when directed by the Architect when such lines are no longer required.
6. 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.
7. Provide all hose and other extensions from connections installed by the Plumbing Contractor and all labor, materials, and supplies required to supply water to the work.
8. Prevent water damage to the work.
9. 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.
10. 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.

11. 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.

1.15 HVAC CONTRACTOR, CONTRACT #3

A. The HVAC Contractor is responsible and pays all costs for the following:
1. Maintaining existing heating system in service during the period between September 15 to completion. 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. See paragraph 1.19 for temporary heat requirements.

1.16 ELECTRICAL CONTRACTOR, CONTRACT #4

A. Electrical Contract #4 shall be responsible for:
1. Temporary Power Source: At each building/renovation area, use the existing electrical power distribution system for temporary power source.
2. Owner's Requirements: Do not disrupt the Owner's needs for continuous power at each building.
3. Electrical Contractor shall provide temporary power and lighting facilities for use of all trades. All temporary light and power shall be in accordance with the required Codes and Safety Standards. The temporary light and power shall be used until permanent light and power is completed.
4. All contractor trailer use / connection charges for power and telephone to be paid by the respective contractor.
5. Temporary Power Distribution
   a. General Requirements: Provide feeders and branch circuits of adequate size and proper characteristics as required to supply temporary receptacle and lighting loads. Size service and feeder conductors to restrict voltage drop to maximum 5 percent at 80 percent power factor. Provide properly sized overcurrent protection for each temporary electrical circuit.
6. Provide temporary receptacle outlets as required for operation of portable tools and appliances during the construction period.
7. Minimum Requirements: Provide a minimum of one duplex 120 volt receptacle per 2500 square feet of building floor area, with maximum spacing of 50 feet on center.
8. Branch Circuits: All temporary receptacle branch circuits to be rated 20 amps with a maximum of (3) duplex receptacles per circuit. Temporary receptacle branch circuits shall be independent of temporary lighting circuits.
9. Provide both interior and exterior lighting as required to provide adequate illumination at all renovated spaces where existing lighting is removed for safe and proper construction operations and Project Site security.
10. Minimum Requirements: Provide illumination levels adequate for construction operations and safe traffic conditions. As a minimum provide one 200 watt lamp per 400 square feet of building floor area, with maximum spacing of 20 feet. Any rooms in excess of 500 sf will receive one 400 watt metal halide fixture for each 1000 sf of area.
11. Barricades: Provide adequate lighting for personnel safety at barricades, ladders, openings and other similar locations.
12. Supplemental Lighting: If required, supplemental lighting beyond minimum requirements shall be provided via suitable portable lighting units with cord and plugs, and shall be paid for by the Contractor or Sub-Contractor requiring such additional lighting.
13. Branch Circuits: All temporary lighting branch circuits to be loaded to a maximum of 1400 watts per 20 amp circuit. Temporary lighting branch circuits shall be independent of temporary receptacle circuits.
14. Restrictions: Do not use permanent lighting systems for temporary construction lighting purposes.
15. Excavation and trenching

1.17 CONTRACT #5 SITE CONTRACTOR

A. Contractor Contract #5 is responsible and pays all costs for the following as related specifically to his work:

B. Temporary telephone service.

C. Temporary toilets, including disposable supplies.

D. Temporary water,

E. Temporary power & lighting.

F. First Aid Station and Supplies.

G. Containers for non-hazardous waste and debris as related to site work.

H. Disposal of wastes containers.

I. Rodent and pest control.

J. Barricades, warning signs, and lights.

K. Site construction enclosure fence.

L. Environmental protection.

M. Temporary erosion and sediment control

N. Temporary dust control.

O. Dewatering facilities and drains.

P. Snow Removal.

1.18 CONTRACT #6 ELEVATOR CONTRACTOR

A. Contractor Contract #5 is responsible and pays all costs for the following as related specifically to his work:

B. Temporary power & lighting.

C. Containers for non-hazardous waste and debris as related to Elevator work including removals.

D. Temporary dust control.

E.

1.19 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-phase1.5 KVA
3. 208 volt, 1-phase2.5 KVA
4. 208 volt, 3-phase5.0 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.

1.20 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.

1.21 ELECTRICAL ENERGY COSTS

A. Paid By Owner: Charges for electrical energy usage for temporary power and lighting will be paid by the Owner, when taken from the Owner's electrical services. Contractor and Sub-Contractors shall exercise

measures to conserve energy usage. Use of owner electric for items not specific to project (e.g. heating construction shanties, etc.) will not be permitted.

B. Temporary Lighting: The Electrical Contractor shall provide and pay all costs for all contractors 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 .
   1. Provide not less than on 200-watt incandescent lamp per 1000 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.
   2. Temporary lighting for temporary signs.
   3. Temporary lighting for corridors, stairways and other exit ways

C. Temporary light and power shall be provided 15 minutes before the normal scheduled start of any trade and 15 minutes after the normal schedule completion of the last trade

D. The Electrical Contractor shall maintain all existing systems, including but not limited to, power, lighting, fire alarm, intercom, etc., within the existing building operational at all times for Owner occupancy and construction.

1.22 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to the Owner or the Architect, Engineer or the Owner's Representative. The Architect and Owner will not accept a prime contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time.
   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.
   3. 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.
   4. The EC 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.
   5. Contractor may elect to use alternative temporary services and facilities equivalent to those specified, subject to acceptance by the Architect/Engineer.

1.23 TELECOMMUNICATIONS SERVICES

A. Each contractor shall provide and pay for its own telephone service.
   1. Provide mobile phone service for all field superintendents and foreman.

B. Temporary Telephones: Each Contractor shall arrange and pay all costs including usage costs for the local telephone company to install temporary service to the project. Provide service of the type and capacity as follows:
   1. Install three separate lines, one for facsimile machine and two for voice, for Architect, Owner, and Construction Manager temporary field office, two telephone instruments. (One instrument shall be portable.)
   2. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities and Owner's trailer.
      a. Provide DSL or T-1 line in primary field office and Owner's trailer.
   3. Costs for telephones required by each prime contractor shall be paid by each contractor.
   4. At each telephone post a list of important telephone numbers, including the following:
      a. Local police and fire department.

b. Doctor.
c. Ambulance service.
d. Contractor's temporary and home office.
e. Owner's Representative temporary and home office
f. Architect's home office.
g. Engineer's home office.
h. Owner's home office.
i. Principal subcontractors temporary and home office

1.24 TEMPORARY HEATING

A. The Mechanical Contractor #3 will maintain 68 degree temperature in all altered areas via permanent or temporary systems. The Mechanical Contractor will submit a detailed plan including sketches indicating his proposed temporary heating system for engineer approval within 4 weeks of contract award. The Electrical Contractor #3 will provide permanent or temporary power for Mechanical Contractor's HVAC units for temporary heating. General Work Contractor #1 will have all windows / doors installed and the work areas fully enclosed. (Any missing components at time of temporary heat activation will be enclosed via plywood and 2" rigid polyiso for a weather-tight insulated enclosure.)

B. The fuel, equipment, materials, operating personnel and methods used therefore shall be at all times satisfactory to the Architect and adequate for the purpose intended.

C. The Contractor shall maintain the critical installation temperatures provided in the technical provisions of the specifications herein for all work in those areas where same is being performed.

D. The maintenance of proper heating, ventilation and adequate drying out of the work is the responsibility of the contractor and any work damaged by dampness, insufficient or abnormal heating, shall be replaced to the satisfaction of the Architect by and at the sole expense of the contractor.

E. Before and during the placing of gypsum and the application of other interior finishes, taping, varnishing, painting, etc. and until final acceptance by the Owner of all work covered by the Contract, the contractor shall, unless otherwise specified in the contract documents, maintain a temperature of 68 degrees F. Coordinate with Division 9 of the Technical Specifications.

F. Use of the permanent system, if granted, shall not shorten, or negate any equipment, or system guarantees required under this contract. Two additional filter changes are to be provided by Mechanical Contract #2. A program of use, maintenance and restoration will be submitted with request for use of systems for temporary services.

1.25 TEMPORARY SANITARY FACILITIES

A. General Contractor shall provide and maintain required facilities and enclosures at building construction area. Provide at time of project mobilization.

B. The Site Contractor shall provide its own Sanitary facilities.

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.

1. Responsibilities: The General Construction Contractor is responsible for temporary sanitary facilities and their maintenance, including supplies, in sufficient quantities for use by all trades. Except for the Site Contractor who shall provide its own sanitary facilities with the same responsibilities specified.

2. Locate toilets and drinking water fixtures 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.
3. Supply and maintain toilet tissue, paper towels, paper cups and other disposable materials as appropriate for each facility, including Owner's Representative's temporary offices. Provide covered waste containers for used material.
4. Install self-contained toilets to the extent permitted by governing regulations.
5. Provide separate toilet facilities for male and female construction personnel.
6. Janitorial Services: Provide janitorial services for Owner's Representative's temporary offices, toilets, and similar areas. Require users of other temporary facilities to help maintain a clean and orderly premises.

1.26 BARRIERS

A. Responsibility: General construction barriers required for the project shall be the responsibility of the General Construction Contractor. **The SITE Contractor shall be responsible for its own temporary fencing.**

B. 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 required. Provide exterior grade acrylic-latex-base enamel for painting sign panels and applying graphics.

C. 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 demolition.

D. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

E. Plywood: For safety barriers, sidewalk bridges and similar direct-contact uses, provide exterior type, 5/8" thick minimum prime and finish painted plywood

F. 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

G. Provide protection for plants designated to remain. Replace damaged plants.

H. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.27 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 shall provide, maintain and pay all costs for temporary fencing until directed to remove fence from the site at the building addition area. The Site Contractor shall be responsible for the fence enclosure at the site construction area including Site Alternates if alternates are accepted.

B. The Site contractor shall be responsible for its own fencing.

C. Construction: Commercial grade chain link fence.

D. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

E. 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. 9 GA 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: 6'
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 be used when approved by the Owner and Architect

1.28 EXTERIOR ENCLOSURES

A. 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.

B. 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.

C. Responsibilities: General Construction contractor is responsible for any temporary enclosures including maintaining watertight roof conditions at all times.

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 and non combustible materials. Individual openings of 25-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.

G. General Contractor will enclose demolished window openings with minimum 1/2" plywood plus 6 mil poly security and weathertight protection of the school.

1.29 INTERIOR ENCLOSURES

A. Provide temporary 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: The General Contractor shall provide dustproof partitions to separate work area from occupied sections of building. Partitions shall be full height metal stud surfaced with minimum 5/8" Type X gypsum board both sides.

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/Construction Manager.
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. General Contractor will install temporary partitions to provide separated contractor access.

1. Provide 5/8' Type X gypsum board.

F. Electrical Contractor shall provide emergency and temporary lighting, FA pull stations and dectors as required.

G. Temporary perimeter and stairwell barricades at grade changes and multiple levels, shall be installed and maintained under the General Contractor Contract #1, if a contractor should need to temporarily relocate barrier, same contractor shall protect personnel in the area and replace barrier to original location. This clause does not void any contractor's liability to maintain a safe work site, but merely to assign temporary work to one contract.

H. Temporary entrances and exits to the building shall be furnished, installed, and maintained under the General Contractor Contract #1 as directed by the Construction Manager. Exits shall be maintained for school exiting in emergency conditions until permanent structures are in place. Appropriate signage will be provided by this contractor at each location.

1.30 SNOW REMOVAL

A. The General Contractor Contract #1 shall provide snow removal at all staging areas and provide access to the building and construction trailers.

B. General Contractor Contract #1 shall provide snow removal at any roof areas to provide access for roof curbs and equipment work.

C. The Site Contractor shall be responsible for his own snow removal as related to the Site work.

1.31 SECURITY - See Section 01 3553

1.32 VEHICULAR ACCESS AND PARKING - See Section 01 5500

1.33 WASTE REMOVAL

A. General Construction Contractor shall provide containers, at grade, for all contractors, except for the, Site Contractor, and (who shall provide their own) sufficient for the depositing of non- hazardous/non-toxic waste materials, and shall remove such waste materials from project site as required or directed by the Owner's representative.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Contractors shall not utilize the Owner's bins or dumpsters.

B. The General Contractor shall broom clean the work area at the end of each work day and weekly damp mop of construction areas.
1. If the contractor fails to clean areas at the end of each work day the Owner shall perform the cleaning and back charge the contractor accordingly.

C. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition. Dumpsters will only be allowed in the fenced staging areas. (No dumpsters next to building while school is in session.

D. Provide containers with lids. Remove trash from site weekly.

E. 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.

F. 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.

G. Provide rodent proof containers located on each floor level to encourage depositing of garbage and similar wastes by construction personnel.

H. Site: Each Contractor shall maintain Project site free of waste materials and debris.

I. 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.

J. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

K. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

L. Each Prime Contractor is responsible to provide dust protection for their construction-related activities.

M. 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.

1.34 PROJECT SIGNS - See Section 01 5813

1.35 FIELD OFFICES - See Section 01 5213

A. Locate field offices, storage and fabrication sheds and other facilities for easy access to the work and as approved by the Owner. Position offices so that window gives the best possible view of construction activities.

B. Field offices, storage and fabrication sheds and other facilities constructed of combustible material shall not be located closer than 15' from existing buildings.

C. Maintain field offices, storage and fabrication sheds, temporary sanitary facilities, waste collection and disposal system, and project identification and temporary signs until near substantial completion. Immediately prior to substantial completion remove these facilities.

D. Contractor's Field offices: General: Each Prime Contractor, at their option, shall provide a temporary field office of sufficient size to accommodate required office personnel at the project site with work-stations furnished and equipped as required.

E. Storage and Fabrication Sheds: Install storage and fabrication sheds, properly sized, furnished and equipped, as required to accommodate work. Comply with applicable provisions specified elsewhere for

distribution and use of temporary utilities. Sheds may be open shelters or fully enclosed spaces, within the building construction area or elsewhere on the project site as approved by the Owner.

1.36 MISCELLANEOUS PROVISIONS

A. Dewatering Facilities and Drains: General: For temporary drainage and dewatering facilities and operations not directly associated with performance of work included under individual work sections, comply with dewatering requirements of applicable Division-2 sections. Where feasible, utilize the same facilities. Maintain site excavations and construction free of water.

B. Temporary Roof Drainage: The General Contractor shall provide temporary drainage where roofing or similar waterproof deck construction is completed 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 or adjoining property, or endanger either permanent work or temporary facilities

C. Snow Removal: The General Construction Contractor shall be responsible for the removal of snow from the building construction contract area to included access roads, excavations, floor and roof deck areas and exits from occupied areas to legal exitways.

1.37 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection unless indicated to remain.

B. Clean and repair damage caused by installation or use of temporary work.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractors property. The Owner reserves the right to take possession of project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
3. Replace air filters and clean inside of ductwork and housings.
4. Replace significantly worn parts and parts subject to unusual operating conditions.
5. Replace lamps burned out or noticeably dimmed by hours of use

D. Restore existing facilities used during construction to original 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

2.1 DE - WATERING FACILITIES AND DRAINS

A. Each Prime Contractor is directly responsible for de-watering their excavations. The responsibility of de-watering of the building construction site as to facilitate the work will be the responsibility of the General Contractor Contract #1, coordinate with CM.

1. Comply with requirements in applicable Division 2 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 architect and/or 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 owner and architect and shall be located in a fenced staging area located at the rear of the facilities building (no trailers by main building). 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.

3.3 STORAGE FACILITIES

A. The 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, at the rear of the facilities building and shall be removed upon completion of the work or when directed. (No storage trailers allowed by the main building.)

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.

3.5 ROOF PROTECTION

A. All Contractors shall provide temporary protection on the 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. 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.

B. Fuel for cutting and heating torches shall be gas only and shall be contained in Underwriters laboratory approved containers.

C. Storage of gas shall be in locations as approved by the Owner and subject to Fire Department regulations and requirements.

D. 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.

E. 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. 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.

F. Each Contractor shall comply with the following requirements relating to welding and cutting:
   1. All cutting and/or welding (electric or gas) must be done only by skilled, certified and licensed personnel.
   2. 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.
   3. Welding or cutting shall not be done near flammable liquid, vapors or tanks containing such material.
   4. 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.
   5. 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.
   6. Adequate fire extinguishing equipment shall be maintained at all welding or cutting operations.
   7. The Contractor shall secure all required inspections.

8. 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.
9. 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 Owner.

G. 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.

3.8 DISCONTINUE, CHANGES AND REMOVAL

A. All Contractors shall:
1. Discontinue all temporary services required by the Contract when so directed by the Construction Manager 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 and minimize energy consumption.
1. Each Prime 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.
2. Ventilate enclosed area to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.
3. Provide equipment as necessary for air and fresh exchange for the work area per OSHA standards.
4. Remove temporary ventilation equipment prior to the completion of construction.
5. General 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.

3.10 ROADS AND PAVED AREAS:

A. Site (Contract #5) shall 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 site related workareas, and to equipment and storage areas and sheds. Minimum of 9" reference NYSDOT Item. #304.3 course.
2. Provide dust-control treatment that is nonpolluting and nontracking. 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 campus roads, as designated (as segregated by the Owner - if required).
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 Site Contractor (Contract #5) will clean roads for debris from site work 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. Site contractor shall plow as required to facilitate site work.
7. Staging Areas:
   a. Temporary parking by construction personnel shall be allowed only in areas so designated. 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. Traffic Regulations:
      a) Access through Owner's entrances shall be limited
      b) Utilize only entrances/temporary roads as designated
      c) Maintain all District traffic regulations
      d) Construction parking will not be allowed adjacent to District buildings, additions or monuments
      e) Employee parking to be located as directed by the Construction Manager.

3.11 TRAFFIC CONTROLS

A. General Contractor (Contract #1) shall provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and “STOP” signs for entrance onto public roads, barricades, flagmen, etc. Comply with requirements of authorities having jurisdiction.

3.12 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)
   8. Project identification sign - 4'x8'x3/4” exterior grade plywood. Text includes project name, owner, architect, CM info and logos. Submit shop drawing for approval prior to fabrication.

3.13 ENVIRONMENTAL PROTECTION: Refer Section 01 5719

3.14 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 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.
   3. Temporary Light and Power.

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.

B. Project meetings will take place in the Owners facilities.

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.

B. Size: For Each Contractor's needs.

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 Construction Manager office spaces ready for occupancy 15 days after date fixed in Notice of Award.

B. Parking: Two hard surfaced parking spaces for use by Construction Manager connected to office by hard surfaced walk.

3.3 MAINTENANCE AND CLEANING

A. Maintain approach walks free of mud, water, and snow.

3.4 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

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.

E. Refer to Site Safety Plan for additional information.

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. Site Contractor #5shall construct and maintain temporary areas adequate to support loads and to withstand exposure to traffic during construction period as required to facilitate site work..

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 Civil 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 TRAFFIC

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

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.

1.2 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.

1.3 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.

1.4 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.

1. Samples of any kind shall be submitted upon Engineer’s request.

C. The Contractor shall submit schedules for the accomplishment of temporary sediment control work.

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

3.1 INSTALLATION

A. 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.

B. 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.

C. 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.

D. 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.

E. Maintenance shall be performed as directed by the Engineer. All sediment deposits shall be considered unsuitable material and properly disposed of.

F. The Contractor shall immediately repair or replace defective or damaged portions of the erosion and sediment control facilities.

G. 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 01 5713

SECTION 01 5719
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

1.2 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. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

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.

1.3 REFERENCE STANDARDS

A. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.4 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.

PART 3 EXECUTION

2.1 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. Do not store construction materials or waste in mechanical or electrical rooms.

D. 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.

E. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

F. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

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.

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. The Contractor (SITE contract #5) is responsible 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. Site Contractor 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 Site Contractor shall furnish and install construction signage as required at 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. Procedures for Brewster Central School District-supplied products.

G. Maintenance materials, extra materials.

1.3 RELATED REQUIREMENTS

A. Section 004401 - Qualifications of Bidders

B. Section 01 1000 - Summary of Contracts.

C. Section 01 2500 - Substitution Procedures: Substitutions made after the Bidding/Negotiation Phase.

D. Section 01 4000 - Quality Requirements: Product quality monitoring.

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 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; 2018.

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 the 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. DO NOT USE products having any of the following characteristics:
   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, asbestos.

C. Where all 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.
6. Are Cradle-to-Cradle Certified.
7. Have a published Environmental Product Declaration (EPD).
8. Have a published Health Product Declaration (HPD).
9. Have a published GreenScreen Chemical Hazard Analysis.

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 OWNER-SUPPLIED CONTRACTOR INSTALLED PRODUCTS

A. See Section 01 1000 - Summary of Contracts for identification of Brewster Central School District-supplied products.

B. Brewster Central School District's Responsibilities:
1. Arrange for and deliver Brewster Central School District reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site Owner-furnished items according to Contractor's Construction Schedule.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
1. 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.
2. Review Brewster Central School District reviewed shop drawings, product data, and samples.

3. Receive and unload products at site; inspect for completeness or damage jointly with Brewster Central School District.
4. Handle, store, install and finish products.
5. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
6. Repair or replace items damaged after receipt.

D. Owner will furnish the following:
1. Electrical Contractor shall coordinate install.
a. Security Cameras, Intercom,Card Readers, etc.

3.3 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.

3.4 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.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, 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.

SUBSTITUTION REQUEST FORM

SUBSTITUTION REQUEST No. _____

(After the Bidding Phase)

Project: BHS Security Vestibule, Synthetic Fields & Related Work

Substitution Request Number: _____

From: _____

Date: _____

A/E Project Number: 23505.01

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 6116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.2 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

1.3 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

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.

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.

1.4 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 D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).

C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

D. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

E. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.6 QUALITY ASSURANCE

A. 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.

B. 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. 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).

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 6180 - Product Standardization for Products that must be incorporated in the project. Substitutions will not be permitted.

G. Section 01 7900 - Demonstration and Training: Detailed requirements.

H. 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 #1: 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 #1: 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 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 #1: 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 #1: 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 #1: 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	
Elevator - Provide Cat. 6 to patch panel	EC	EC	

Brewster CSD - Package #1: 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	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	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 #1: 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 #1: 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	Owner Assigned Security Vendor	EC	
Power for Access Controller/transformer	EC	EC	

Brewster CSD - Package #1: 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),	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,	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	EC	EC	
F.A. Devices address labelling at each device.	EC	EC	
Fire Alarm Floor Layout Plaque.	EC	EC	

Brewster CSD - Package #1: 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 Agent	Owner Third Party Commissioning Agent	Owner Assigned F.A. Vendor and EC to assist Third Party Commissioning Agent.

Brewster CSD - Package #1: 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	EC	EC	
New P.A. System Cable - From indicated rooms to Main P.A.	EC	EC	
P.A. System Speaker, Call-In, Volume Attenuator, power	EC	EC	
P.A. System Programming.	EC with Vendor	EC with Vendor	
Provide cut out relay for stand-alone sound	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 #1: 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	HVAC Sub Controller	HVAC Sub Controller	Refer to Specification Section 23 00 00 for additional information.
Commissioning (Third Party)	Owner Third Party	Owner Third Party	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 and including asbestos/lead abatement .

D. Site scoping.

E. Construction layout.

F. Surveying

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. Surveying for laying out the work.

O. Dust control

P. Cleaning and protection.

Q. Final Cleaning.

R. Starting of systems and equipment.

S. Demonstration and instruction of Brewster Central School District personnel.

T. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

U. General requirements for maintenance service.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

C. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.

D. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

E. Section 01 3553 - Security Procedures

F. Section 01 5713 - Temporary Erosion and Sediment Control: Additional erosion and sedimentation control requirements.

G. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

H. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

I. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

J. Section 07 8400 - Firestopping.

K. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

1.4 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.5 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 site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Certified Surveys: Submit two copies signed by land surveyor or professional engineer for each the following surveys:
   1. Foundation Survey: After completion of foundations, as-built survey shall be submitted before continuing with the work.
   2. 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.
   3. 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.
   4. 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 3 copies and 1 mylar reproducible showing the Work performed and record survey data.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Call ProTek (718) 472-2304 or info@ProTekLocating.com, before beginning any excavation at least two (2) working days prior to the start of construction, and locate and identify all underground utilities etc.

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.

1.6 QUALIFICATIONS

A. Refer to Section 00 4401 - Qualification of Bidders

B. Refer to individual sections for additional requirements.

C. 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,

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.

1.7 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.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.8 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. 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.

1.9 CODES, PERMITS, FEES, ETC. Refer to Section 01 4100 Regalatory Requirements

1.10 MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

A. Effective July 18, 2008 - Pursuant to NYS Labor Law §220-h - On all public work projects of at least $250,000 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.

PART 3 EXECUTION

3.1 EXAMINATION

A. 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.

B. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

D. Examine and verify specific conditions described in individual specification sections.

E. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

F. Verify that utility services are available, of the correct characteristics, and in the correct locations.

G. 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 or Construction Manager four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copies to Architect and Construction Manager, participants and those affected by decisions made.

3.4 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Construction Manager of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Construction Manager the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Construction Manager.

H. Utilize recognized engineering survey practices.

I. 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.

J. 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.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.5 REMOVAL AND DUST CONTROL

A. The following procedures shall be followed when removals will create dust:
   1. 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.
   2. 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 moveable objects will be remove/relocated away from the vicinity of the removals by the Owner. Floors and fixed furniture, cases etc. shall be covered with a six mil plastic sheet by the GC - Contract #1.
      e. Owner shall relocate/reinstall objects to their original location.
      f. All corridors from renovated areas to exitways, used by Contractors, shall be mopped and left clean daily.
      g. Elevator Contract #6 shall be responsible for this work in his related work areas.
   3. GC 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.
   4. 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.
   5. Do not leave any openings unprotected at end of work day or during periods of excessive cold weather or precipitation.
   6. 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 Construction Manager 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.

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 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-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 each Contractor. 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 offending Contractor.

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 Owner's Representative or 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 Contractor. Working areas are to be broom swept on a daily basis by the General Construction Contractor.

F. Each Prime Contractor is responsible to provide dust protection for their construction-related activities.

G. 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. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. 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.

G. Prohibit traffic from landscaped areas.

H. 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 the GC Contract #1 General Construction for Contracts #1, #2, #3, #4 and all costs for final cleaning shall be included in the Base Bid. Final cleaning responsibility shall be limited to all new additions and areas where renovations occur.

1. Elevator Contractor shall be responsible for final cleaning in their work areas including access areas used for the work in their contract.

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. Replace filters of operating equipment.

H. Clean debris from roofs, scuppers, 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. Wax all resilient flooring.

U. Remove labels that are not permanent.

V. 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

W. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

X. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

Y. Replace parts subject to unusual operating conditions.

Z. Clean ducts, blowers, and coils if units were operated without filters during construction.

AA. 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.

AB. Leave Project clean and ready for occupancy.

AC. 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

3.24 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

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 1 Section "Selective Removals" for removals of selected portions of the building for alterations.

B. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.

C. Divisions 2 through 14 Sections for additional requirements and limitations applicable to cutting and patching individual parts of the Work.

D. 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.

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.

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 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 shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, 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.

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.

1.2 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.

1.3 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.4 SUBMITTALS

A. See Section 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 3 EXECUTION

2.1 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.

2.2 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 5000 - Temporary Facilities and Controls.

D. Section 01 7000 - Execution.

E. Refer to reference drawing, "Site Safety Plan".

1.4 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 specified item.

D. Samples: Submit sample when requested.

E. Manufacturer's Installation Instructions: Provide installation requirements and rough-in dimensions.

F. 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. Refer to special sound control construction for band, coral and CAD rooms and Division 13 specifications.

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. Provide where required:
   a. Access door and frame units, fire-rated and non-fire-rated, in wall, ceiling, and floor locations.
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. 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.
5. 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.
6. All access doors in Toilets, Janitor Closets, and Storage Rooms 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 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 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.

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 for their own required equipment.
      a. All base flashing and pitch pockets for equipment installed on existing roof systems shall be 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 Construction Manager 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 offending 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 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.

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 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.

1.34 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.

1.35 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.

1.36 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.

1.37 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.

1.38 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.

1.39 JURISDICTIONAL DISPUTES

A. Refer to Section 01 1000

1.40 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 BHS Security Vestibule, Synthetic Fields & Related Work Brewster High School

Project: BHS Security Vestibule, Synthetic Fields & Related Work

Owner: Brewster Central School District

Architect Project #: 23505.01

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 to be commissioned and 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. Electrical systems and equipment.

C. Training of Brewster Central School District personnel in care, cleaning, maintenance, and repair is required for:

1.3 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01 9113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements01 3000, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Construction Manager.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Brewster Central School District will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Construction Manager and Owneror review and inclusion in overall training plan.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.

1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

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 Brewster Central School District.

B. Demonstrations conducted during Functional Testing need not be repeated unless Brewster Central School District personnel training is specified.

C. Demonstration may be combined with Brewster Central School District personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Brewster Central School District will provide classroom and seating at no cost to Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum two hour segments.

F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

G. Training schedule will be subject to availability of 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.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.

2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:
1. Review the applicable O&M manuals.
2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

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.

C. The Commissioning Authority is employed by Brewster Central School District.

1.2 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Elevating and conveying systems.

C. HVAC System, including:
   1. Major and minor equipment items.
   2. Piping systems and equipment.
   3. Terminal units.
   4. Control system.

D. Electronic Safety and Security:
   1. Security system, including doors and hardware.
   2. Fire and smoke alarms.

E. Communications:
   1. Voice and data systems.
   2. Public address/paging.

F. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.3 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

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 02081

ASBESTOS ABATEMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The Asbestos abatement contractor shall perform the following work as described below and indicated on the drawings. The drawings are only a diagrammatic representation of the Work Areas and do not constitute the actual quantities of material. The Asbestos abatement contractor is responsible for the confirmation of the actual total quantities of the Work. The Asbestos abatement contractor shall provide all plant, labor, equipment and materials complete for performance of the Work in accordance with the Contract Documents. All asbestos material is to be disposed of as ACM waste. Quantities indicted below are confirmed asbestos.

BREWSTER HIGH SCHOOL
50 Foggintown Road, Brewster, NY 10509

1. Drawing ACM-001: First Floor (Structural Bridges)

a. Remove and dispose of confirmed asbestos-containing Expansion Joint Tar, Black within **Work Area 1** utilizing NYS DOL 12 NYCRR Part 56-11.6 § Exterior Project Removal of Non-Friable ACM Roofing, Siding, Glazing Compound, Transite, Tars, Sealers, Coatings and Other NOB ACMs Procedures.

Work Area #	Location	Asbestos-Containing Material	Approximate Quantity	Removal Procedure
1	Structural Bridges (two)	Expansion Joint Tar, Black	200 SF (100 SF each)	NYS DOL 12 NYCRR Part 56-11.6 § Exterior Project Removal of Non-Friable ACM Roofing, Siding, Glazing Compound, Transite, Tars, Sealers, Coatings and Other NOB ACM Procedures

2. Drawing ACM-002: PAC/Main Entrance Overhang Roof

a. Remove and dispose of confirmed asbestos-containing Through Wall/Eave Flashing Tar, Black within **Work Area 2** utilizing NYS DOL 12 NYCRR Part 56-11.6 § Exterior Project Removal of Non-friable ACM Roofing, Siding, Caulking, Glazing Compound, Transite,

Tars, Sealers, Coatings, and Other NOB ACMs Procedures. All Roofing or Flashing to be affected by the current SOW must be removed as part of the abatement due to contamination/proximity to confirmed asbestos containing materials.

Work Area #	Location	Asbestos-Containing Material	Approximate Quantity	Removal Procedure
2	PAC/Main Entrance Overhang Roof	Through Wall/Eave Flashing Tar, Black	300 LF	NYS DOL 12 NYCRR Part 56-11.6 § Exterior Project Removal of Non-Friable ACM Roofing, Siding, Glazing Compound, Transite, Tars, Sealers, Coatings and Other NOB ACM Procedures

B. The Contractor is responsible for completing all notifications and variances required to meet the determined start date (if applicable).

C. If asbestos containments are required, the Contractor shall establish the asbestos containments so as to not interfere with operation of or access to the temporary equipment that shall be installed by others.

D. The Contractor shall field verify the amount of ACM and familiarize him/her-self with all variable field conditions in the building before the submission of his/her quote. The quantities presented in this specification are approximate only and should not be used solely as the basis for any quote. Any discrepancies or difference in the approximate and actual quantities shall be resolved before the award of any Contract. No change order relative to ACM material quantity will be permitted after the award of the Contract. In the event that suspect materials not included in this Specification are encountered while the work is in progress, such material shall be tested and, if confirmed ACM, removed as ACM, in accordance with the procedures contained herein. The discovery of any new material(s) should not delay the progress of the work as contained in this specification. Payment for any additional work will be considered on a case-by-case basis by the Environmental Consultant and Brewster CSD. It is the responsibility of the Contractor to determine and negotiate the full cost of any such payment prior to performance of any additional work.

F. ACM shall be properly handled, packaged, and transported for disposal in a landfill in accordance with all Federal, State and Local regulations. After September 4, 2006, the Contractor shall follow Part 56 of Title 12 of the Official Compilation of

Codes, Rules and Regulations of the State of New York (Cited as 12 NYCRR Part 56) as amended effective March 21, 2007. All related manifests and shipping logs shall be provided to Brewster CSD upon or before the end of the project.

G. All work shall be accomplished in strict adherence to the project Specification, applicable Federal, State, and Local Regulations. Whenever there is a conflict or overlap of the above references, the more stringent provision shall apply.

H. The Contractor's industrial hygiene practices during asbestos abatement will be monitored by Brewster CSD Environmental Consultant. The Contractor shall be responsible for monitoring his/her own construction safety work practices for compliance with the OSHA regulations.

I. The Asbestos Contractor shall provide the best available technology, and state-of-the-art procedures and methods of execution, clean-up, disposal, and safety.

J. The Contractor will be required, if approved by Brewster CSD and/or its Representative, to obtain at his/her own expense appropriate variances from regulatory agencies as required to complete the safe removal of asbestos containing material as described in this specification.

K. Brewster CSD environmental consultant will sample all suspect materials that may be identified during the course of demolition, if applicable. The Contractor shall provide access to the consultant to perform the testing and no additional costs will be paid for the time it takes to perform the testing. The contractor shall provide itemized cost proposal to Brewster CSD which must include separate costs for the abatement of the individual materials revealed to be ACM (if applicable). Additional asbestos-containing materials shall not be abated without written authorization from Brewster CSD or environmental consultant. The contractor will not be compensated for any additional materials that can be encountered during the abatement project, without prior written authorization from Brewster CSD or environmental consultant.

1.02 **PHASING OF WORK**: This work shall include asbestos abatement associated with upcoming MEP and Fire Protection Upgrade project. The Asbestos Contractor shall perform and complete the abatement of asbestos-containing materials during regular working hours, Monday through Friday between 8:00 am and 4:00 pm or as directed by the facility. It is the Contractor's responsibility to ensure that acceptable visual inspection and air monitoring results are obtained with fiber count of no greater than 0.01 f/cc and are completed prior to the return of building occupants or other trades. All work shall be coordinated with Brewster CSD and Brewster CSD's Environmental Consultant prior to start of any work. The Brewster CSD Environmental Consultant shall be present whenever any asbestos abatement work is being conducted.

1.03 AUTHORITY TO STOP WORK: Brewster CSD and the Environmental Consultant shall have the authority to stop the abatement work at any time the contractor's work is not in conformance with the Specifications and applicable regulations. The stoppage of work shall continue until conditions have been corrected to the satisfaction of Brewster CSD and the Environmental Consultant. Standby time to resolve the problems shall be at the contractor's expense.

1.04 SITE REQUIREMENTS:

A. Noise Control: Provide mufflers or other acceptable means of noise reduction for all equipment to be used by the Contractor. Observe local laws regarding noise control.

B. Wastewater: All water used by the Contractor during asbestos abatement activities shall be collected and passed through a water filtration system capable of filtering particles down to 5 microns prior to being discharged into the sanitary sewer. The Contractor shall be responsible for connection to the sanitary sewer, and for providing piping, pumps, water filtration systems, and other items necessary to collect, transport, filter, and dispose of the wastewater.

C. Log In/Out: The Asbestos Contractor must ensure all workers log in and out daily at the site.

D. The location of the Decontamination Unit shall be as per abatement design drawings. All variations must be coordinated and approved by the site manager and Brewster CSD Environmental Consultant.

1.05 HEALTH AND SAFETY:

A. Toxic Effects: The Contractor shall assume all responsibility for any toxic effects to workers from the air supplied to respirators, or from toxic or damaging vapors or residues resulting from the use of encapsulant and/or wetting agents or other substances used by the Contractor during construction.

B. Chemical/Biological Hazards: The known chemical/biological hazards on site include asbestos-containing material and debris. The Contractor shall provide materials, equipment and training to its workers to ensure their protection from these and any other chemical/biological hazards which may be identified during the course of this work.

C. Physical Hazards: The Contractor shall provide safety equipment and training to his/her workers to ensure their protection from any physical hazards including but not limited to trip/fall hazards, working at elevation, heat stress, contact with

energized (hot) active equipment, noise, overhead bump hazards, and electrical shock that may be present during the Work.

D. Safety Act: The Occupational and Safety Health Act (OSHA) of 1970, as amended, shall be strictly complied with during the course of this project. This Act shall govern the conduct of the Contractor's workmen, tradesmen, material-men, and subcontractors, and visitors to the project site.

E. Accident Prevention: In order to protect the lives and health of his/her employees, the Contractor shall comply with all pertinent provisions of the latest edition of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc. and shall maintain an accurate record of all accidents which occur during the project. An injury or loss of life must be immediately reported by the Contractor to the Brewster CSD and/or its Representatives, and a copy of the Contractor's report to his/her insurer of an accident must be provided to the Brewster CSD and/or its Representatives.

F. Emergency Response: The Contractor shall establish an Emergency Response Team made up of members of his/her work force. Team members shall be trained, organized, and capable of responding in the event of an accident, fire, or other emergency. The Contractor shall designate a site Safety Coordinator to train team members regarding the location and use of site-specific fire/life safety equipment. As a minimum requirement, members of the Emergency Response Team shall be knowledgeable in standard first aid and CPR techniques, fire extinguisher use, and evacuation procedures.

G. Workmen Protection: The Contractor shall provide and maintain all safety measures necessary to properly protect workmen.

H. Emergency Actions: In an emergency affecting the safety of life, the work, or adjoining property, the Contractor, to prevent such threatened loss or injury without special instruction or authorization from the Brewster CSD and/or its Representatives, is hereby permitted to act at his/her discretion.

I. Hazard Communication Act: The Contractor shall comply with the Hazard Communication Standard promulgated by the Occupational Safety and Health Administration (OSHA No. 29 CFR 1910.1200). This program ensures that all employers provide the information they need to inform and train employees properly and to design and put in place employee protection program. It also provides necessary hazard information to employees so they can participate in, and support, the protective measures needed at their work place. The contractor shall ensure that labels or other forms of warning are legible in English. Employer having employees who speak other languages must add the information in their languages. See OSHA 29 CFR 1910.1200 for more details.

1.06 WORK SUPERVISION AND COORDINATION:

A. Abatement Contractor's Supervisor: From the start of work through to the project completion the Contractor shall have on-site a responsible and competent supervisor who posses valid NYSDOL Supervisor certifications. As a minimum, the Asbestos Contractor's Supervisor shall meet the qualifications as required by Article 1.12, for a job supervisor. The Supervisor shall be on site during all working hours. When the Supervisor must leave site during work, a temporary Supervisor shall be appointed.

B. Quality of Work: The Supervisor shall supervise, inspect and direct the Work competently and efficiently, devoting such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. The Supervisor shall be responsible to see that Work complies accurately with the Contract Documents, and that all Work installed is of good quality and workmanship.

1.07 SUBMITTALS: Unless otherwise noted the Contractor shall submit three (3) copies of each APPLICABLE submittal to the Brewster CSD Environmental Consultant and its Representatives for review and/or approval. The Contractor shall provide the following:

A. Pre-Project Submittal:

1. Certificates of Insurance naming Brewster CSD as additional insured.

2. All required bonds. All bonds shall be underwritten by a United States based, preferably New York State, A or B rated bonding company.

3. List of Subcontractors.

4. Health and Safety Plan: Provide a written Health and Safety Plan addressing procedures for work place safety. As a minimum, the following topics shall be addressed in the plan:

   a. Hazard Communication. Procedure on how physical and health hazards associated with the work are identified and communicated to employees, and name of the person responsible for implementation of the Hazard Communication Program.

   b. Guidelines for assessment and prevention of heat stress.

   c. Procedures for using ladders safely.

d. Electrical safety procedures.

e. Emergency Action Plan: The Contractor shall submit for review a written Emergency Action Plan. This Plan shall outline the contingency actions to be performed for emergencies including fire, accident, power failure, supplied air system failure, breach of work area containment, unexpected asbestos contamination in the site area and on the adjoining grounds, or spilling of asbestos material being hauled to storage and/or disposal. This Plan shall identify the manner in which emergencies are announced, emergency escape procedures and routes, and procedures to account for all employees after evacuation. The Plan shall identify those persons responsible for fire/life safety duties including the Site Safety Coordinator, persons responsible for fire prevention equipment and the control of fuel source hazards, and the members of the Emergency Response Team (see Paragraph "Emergency Response" of this Section). This Plan shall be readily available for review by all workers.

f. Fall Protection Plan: The Contractor shall submit for review a written Fall Protection Plan. This plan shall outline the actions to be performed to protect personnel when they are working at elevation. The plan shall detail specific fall protection devices to be utilized, training provided to personnel for same and training of designated competent person in charge of and responsible for the elevated work site.

4. Proof of written notifications required by Paragraph "Codes, Permits and Standards" of this Section. Proof that all required permits and variances have been obtained.

5. Proof of written notification to the local police department, fire department and Facility (include a copy of required by NYS DOL ICR 56 section 56-3.6a ten day notice) that asbestos abatement work is being conducted. As a minimum, the notification letter shall include the address of the Facility, dates work is to be performed, and drawings indicating the areas to undergo abatement.

6. Documentation of compliance with all requirements of paragraph "Requirements and Qualifications" of this Section. Submittal shall include:

a. Proof that the job supervisors, foremen, and asbestos abatement workers meet State certification and license requirements.

b. Proof of a current medical surveillance program for all Contractor's personnel to work on this project.

c. Completed and notarized Certificate of Worker's Release for each asbestos abatement worker, workers of other trades, or supervisory personnel who enter the work area or otherwise contact ACM.

7. Proof of a respiratory protection program. Submit level of respiratory protection intended for each operation required by the project.

8. Proof of historic airborne fiber data. Submit airborne asbestos fiber monitoring data from an independent air monitoring firm to substantiate selection of respiratory protection proposed. Data shall include the following for each procedure required by the work: 1. date of measurement; 2. type of work task monitored; 3. methods used for sample collection and analysis, and; 4. number, duration and results of samples taken.

9. Proof that a landfill site has been located, and arrangements for transport and disposal of asbestos-containing or asbestos-contaminated materials have been made. Provide the name and location of the landfill, and waste transport company, if applicable.

10. Manufacturer's literature on all proposed job-related equipment and products to be used on this project. Include Safety Data Sheets (SDS) for encapsulant, fire retardant plastics, mastic remover and other chemicals to be used on this project.

11. A detailed Asbestos Removal and Disposal Work Plan which describes all aspects of the work to be performed for this project. The Plan shall include the following:

a. A detailed description of the work area enclosure. Provide shop drawings (with dimensions and locations) of proposed decontamination facilities and work areas. These drawings shall indicate the following: 1) areas to be sealed off and work area boundaries; and 2) proposed layout and location of the decontamination enclosure systems. Include a detailed description of any modifications or changes to be made to the specified negative pressure work area enclosure.

b. Specimen of the daily log proposed for use. Minimally, the log should include the date(s) and time(s) when all personnel enter and leave the work area(s).

B. During Work Submittal:

1. Schedule of Work Changes: Any changes in the Schedule of Work proposed by the Contractor shall be submitted for approval to Brewster CSD no later than seven days prior to the commencement date of the proposed change. A revised Schedule shall be submitted at the end of each week.

2. Notarized copy of payroll shall be submitted to the Brewster CSD on a weekly basis. Contractor shall use DOL form for wage payment.

3. A "Request For Services" form shall be submitted at least 24 hours in advance of required air monitoring tests and inspections to be performed by the Brewster CSD Environmental Consultant.

4. Results of all air monitoring performed by the Contractor shall be posted within 24 hours for regular abatement project after collection for all workers to see. A copy of the results shall be given to the Brewster CSD Environmental Consultant at the same time.

5. A certified, signed, and completed copy of each "Waste Shipment Record" form used, and receipts from the landfill operator which acknowledge the Contractor's delivery(s) of material, shall be submitted to the Consultant and Engineer within thirty days following removal of ACM from building.

6. A copy of the bound log book.

C. Post Project Submittal:

1. A notarized "Release of Liens" in a form acceptable to the Brewster CSD. Use the standard AIA form. Such notarized release of all liens shall certify that all subcontractors, labor suppliers, etc., have been paid their pro rate share of all payments to date, that the contractor has no basis for further claim, and will not make further claim for payment in any account after the first payment is made to him.

2. Proof of payment of prevailing wage rate to direct employees and subcontractor.

3. Notarized copies of a daily log showing the date(s) and time(s) of entrance to and exit from the work area(s) for all persons.

4. Compilation in chronological order of all air monitoring records pertaining to this project.

5. Compilation of all completed and signed Waste Shipment Record forms, bills of lading, or disposal receipts pertaining to this project.

6. Copies of notifications and checks to applicable agencies (see Subparagraph "Pre-Project Submittal Information" of this Section) that the asbestos abatement project has been completed.

7. Contractor shall submit the following items as part of his final submittals: Paid invoice verifications for sub-contractor (for Time and Material job), service contract agreement, insurance certificates, copies of the workers licenses (NYSDOL), and other submittal required for the Specification.

1.08 FIRE PROTECTION AND EMERGENCY EGRESS: The Contractor shall be responsible to the security and safeguarding of all areas turned over by the facility to the Contractor. The Contractor shall designate to his/her workers and other building occupants a means of egress in case of emergency.

A. The Contractor shall establish emergency and fire exits from the work area. First aid kit, 2 full sets of protective clothing and respirators shall be provided for use by qualified emergency personnel in the clean room of the decontamination facility.

B. For full containment only, the Contractor shall provide a secure work area to protect against unauthorized entry into and around the work area. Any hazardous conditions shall be reported to the contractor's Supervisor and the contractor shall correct the hazard immediately. Any intrusion or incident shall be documented in a bound log book which shall be maintained at the project site.

1.09 CLEAN-UP:

A. Asbestos Related Clean-up: All clean-up work related to asbestos abatement work shall be in strict accordance with general technical requirements and this specification.

B. Final Site Cleaning: Upon completion of the work, the Contractor shall remove all temporary construction, decontamination facilities, and unused materials placed on site by the Contractor; put the premises in a neat and clean condition; and provide

all sweeping, cleaning, and washing required to restore the site to its original condition.

1.10 CODES, PERMITS, AND STANDARDS:

A. The Contractor shall be solely responsible for compliance with all applicable federal, state (12 NYCRR Part 56 Adopted March 21, 2007), and local laws, ordinances, codes, rules, and regulations which govern asbestos abatement work or hauling and disposal of asbestos waste material. The current issue of each document shall govern. All work shall comply with all applicable codes and regulations as amended including: OSHA Title 29CFR, part 1910(including sections 1001,134,1926.2 and 1926.1200); EPA Title 40 CRF Part 61; NYSDEC Title 6, Part 364 and NYSDOH Title 10, Part 73.

B. Before starting the work, the Contractor shall examine the Technical Specification for compliance with codes and regulations applicable to the work and shall immediately report any discrepancy to the Brewster CSD Environmental Consultant.

C. Where conflict among requirements or with these Specifications exists, the more stringent requirements shall apply.

D. Permits, State Licenses, and Notifications: The Contractor shall be responsible for obtaining necessary permits, variances, state licenses, and certifications of personnel in conjunction with asbestos removal, hauling, and disposition and shall provide timely notification of such actions as may be required by federal, state, regional, and local authorities. Fees and/or charges for these licenses, permits, and notifications shall be paid by the Contractor. Contractor shall use all notification forms where applicable.

1. Agency Notification: At least 10 days prior to commencement of any asbestos removal, the Contractor shall prepare written notification to EPA Region 2, to the New York State Department of Labor (NYSDOL), and all other applicable agencies having jurisdiction. In addition, the Contractor shall be required to obtain any other permits for work covered under this specification including permits required for air sampling.

1.11 TERMINOLOGY: The following commonly-used terms are defined in the context of these Specifications:

A. Asbestos Project: Work that involves the removal, encapsulation, enclosure, repair or disturbance of friable or non-friable asbestos, or any handling of asbestos material that may result in the release of asbestos fibers. For the purpose of

compliance with this Part, an asbestos project shall include any disturbance of asbestos fibers, and the planning, asbestos survey (as per Subpart 56-5.1), design, background air sampling, inspection, air sampling and oversight of abatement work, cleanup, and the handling of all asbestos material subject to abatement, as well as the supervising of such activities. Installation of friable ACM shall also be considered an asbestos project. An asbestos project starts with Phase I when the planning, asbestos survey, and design work begins or is required to begin.

B. Asbestos-Containing Material (ACM): Any material or product which contains more than 1 percent asbestos.

C. Aggressive Air Sampling: Air monitoring samples collected while a leaf blower, fans, or other such devices are used to generate air turbulence within the work area.

D. Air Filtration Device (AFD) - A portable local exhaust system equipped with HEPA filtration, capable of maintaining a constant low velocity air flow into contaminated areas from adjacent, uncontaminated areas and capable of maintaining a negative air pressure with respect to the adjacent, uncontaminated areas.

E. Air Lock: A system for permitting ingress or egress to the work area while permitting minimal air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways placed a minimum of three feet apart.

F. Air Monitoring: The process of measuring the fiber content of a specific volume of air in a stated period of time. Personal air sampling results shall be calculated to reflect the employee's eight-hour time weighted average (TWA) exposure. Area sampling results are reported directly, without calculating the TWA.

G. Amended Water: Water to which a surfactant has been added.

H. Asbestos Removal Encapsulant: A chemical solution used in place of amended water during asbestos removal to penetrate, bind, and encapsulate the asbestos-containing material.

I. Authorized Visitor: Brewster CSD Environmental Consultant or representatives of any regulatory or other agency having jurisdiction over the project.

J. Brewster CSD Environmental Consultant: Brewster CSD agent who is authorized to exercise general contract administration and industrial hygiene inspection of the work.

K. Certified Industrial Hygienist (CIH): One certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

L. Class II asbestos work: Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Class I asbestos work includes the removal of thermal system or surfacing materials.

M. Competent Person: Definition and responsibilities as set down in 29 CFR 1926.1101(b) and as outlined herein.

N. Curtained Doorway: A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms.

O. Decontamination Enclosure System: A series of connected rooms for the decontamination of workers (a Personnel Decontamination Enclosure System) or of materials and equipment (Equipment Decontamination Enclosure System).

P. Equipment Decontamination Enclosure System: A decontamination system for waste materials and equipment, typically consisting of a designated area of the work area, a washroom, and a holding area, with an air lock between any two adjacent rooms and a curtained doorway between the holding area and the non-work area. Not to be used for personnel entry/exit.

Q. Encapsulant (Sealant): A liquid material which can be applied to ACM and which controls the possible release of asbestos fibers from the material, either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

R. Encapsulation: Application of an encapsulant to asbestos-containing building materials to control the possible release of asbestos fibers into the ambient air.

S. Enclosure: Procedures necessary to completely enclose ACM behind air-tight, impermeable, permanent barriers.

T. Excursion Limit (EL): The EL is an airborne concentration of asbestos to which no employee shall be exposed when not using respiratory protection. The EL is 1.0 f/cc as averaged over a 30-minute period.

U. Fixed Object: A unit of equipment or furniture in the work area which cannot be removed from the work area.

V. Friable: Any material which, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure, or is capable of being released into the air by hand pressure.

W. Full Facepiece High Efficiency Respirator (FFHER): A respirator which covers the wearer's entire face from the hairline to below the chin and which is equipped with a HEPA filter.

X. Half Mask High Efficiency Respirator (HMHER): A respirator which covers one-half of the wearer's face, from the bridge of the nose to below the chin, and is equipped with HEPA filters.

Y. HEPA Filter: A high efficiency particulate air (HEPA) filter capable of trapping and retaining 99.97 percent of the fibers of 0.3 micrometer or larger in diameter.

Z. HEPA Vacuum Equipment: High efficiency particulate air (HEPA) filtered vacuuming equipment having a UL 586 filter system capable of collecting and retaining asbestos fibers.

AA. Large Asbestos Project: Large asbestos project shall mean an asbestos project involving the disturbance, enclosure, encapsulation, repair or handling of 160 square feet or more of ACM, PACM or asbestos material or 260 linear feet or more of ACM, PACM or asbestos material.

AB. Lockdown: Procedure of applying an encapsulant as a protective coating or sealant to a surface from which ACM has been removed in order to control and minimize airborne asbestos fiber generation that might result from residual asbestos-containing debris.

AC. Minor Asbestos Project: Minor project shall mean an asbestos project involving the disturbance, enclosure, encapsulation, repair or handling of 10 square feet or less of ACM, PACM or asbestos material or 25 linear feet or less of ACM, PACM or asbestos material.

AD. Movable Object: A unit of equipment or furniture which can be removed from the work area.

AE. Plasticize: To cover floors and walls with plastic sheeting as herein specified.

AF. Permissible Exposure Limit (PEL): The PEL is an airborne concentration of ACM to which no employee shall be exposed when not using respiratory protection. The OSHA PEL is 0.1 f/cc expressed on an 8-hour time weighted average (TWA).

AG. Personnel Decontamination Enclosure System: A decontamination system for personnel and limited equipment, typically consisting of an equipment room, shower room, and clean room, with an air lock between any two adjacent rooms, and a curtained doorway between the equipment room and the work area, and a curtained doorway between the clean room and the non-work area. The decontamination system serves as the only entrance/exit for the work area.

AH. Powered Air Purifying Respirator (PAPR): Either a full face-piece, helmet, or hooded respirator that powers breathing air to the wearer after the air has been purified through a HEPA filter.

AI. Regulated Abatement Work Area: The portion of the restricted area where abatement work actually occurs. For tent work areas, the interior of each tent is a regulated abatement work area. For OSHA Class I and Class II asbestos abatement, the interior of the restricted area containment enclosure is the regulated abatement work area. For exterior non-friable asbestos abatement conducted without the establishment of negative air ventilation systems or containment enclosures, the entire restricted area surrounding the abatement location is considered to be the regulated abatement work area.

AJ. Removal: The act of removing and transporting asbestos-containing or asbestos-contaminated materials from the work area to a suitable disposal site.

AK. Small Asbestos Project: Small asbestos project shall mean an asbestos project involving the removal, disturbance, repair, encapsulation enclosure or handling of more than 10 and less than 160 square feet of ACM, PACM or asbestos material or more than 25 and less than 260 linear feet of ACM, PACM or asbestos material.

AL. Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.

AM Tent Procedure: A fire retardant polyethylene enclosure that includes walls, ceiling and a floor as required to remove ACM, PACM or asbestos material.

AN. Type C Respirator: A respirator which supplies air to the wearer from a source outside the work area by means of a compressor.

AO. Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with amended water or asbestos removal encapsulant and by afterwards disposing of these cleaning tools as asbestos-contaminated waste.

AP. Work Area: Designated rooms, spaces, or areas of the project where asbestos abatement actions are to be undertaken or which may become contaminated as a result of such abatement actions. A contained work area has been sealed, plasticized, and equipped with an airlock entrance or a decontamination enclosure system. A non-contained work area is an isolated or controlled-access area which has not been plasticized.

1.12 REQUIREMENTS AND QUALIFICATIONS:

A. Minimum Experience: The Contractor shall have experience with abatement work, as evidenced through participation in at least ***two*** asbestos abatement projects of complexity comparable to this project.

B. Experience and Training: The Contractor's job supervisors, foremen, and workers shall be adequately trained and knowledgeable in the field of asbestos abatement. All personnel engaged in asbestos abatement or related activities shall have New York State DOL certifications. All phases of the work shall be executed by skilled craftsmen experienced in each respective trade. Proof of such experience shall be submitted upon request by the Brewster CSD. Improperly trained, untrained, or inexperienced personnel shall not be allowed in the work area(s). Personnel shall meet minimum training and experience requirements outlined in this Section.

1. The Contractor's on-site job supervisor shall have successfully completed, within the last twelve months, the NYSDOH-approved course "Supervision of Asbestos Abatement Projects", and shall be qualified as a NYSDOL-certified Contractor/Supervisor. Course must be provided by an NYSDOH-approved training provider. The supervisor shall have experience with abatement work, as evidenced through participation in at least two asbestos abatement projects of complexity comparable to this project.

2. The job supervisors and foremen shall be thoroughly familiar with and experienced in asbestos removal and related work and shall meet the requirements of a competent person set down in OSHA Standard 29 CFR 1926.1101.

3. All asbestos abatement workers shall be knowledgeable, qualified, and trained in the removal, handling, and disposal of asbestos material and in subsequent cleaning of the affected environment. All asbestos abatement workers shall be certified as having attended and satisfactorily completed

asbestos worker training in accordance with OSHA Standard 29 CFR 1926.1101(k)(3). Course must be provided by an NYSDOH-approved training provider.

4. The Contractor's job supervisors, foremen, and asbestos abatement workers shall be certified and licensed as required by the NYSDOL.

5. Prior to commencement of work, all personnel who are to enter the work area shall be instructed in and shall be knowledgeable of the appropriate procedures for personnel protection and asbestos abatement. On-site training in the use of equipment and facilities unique to this job site shall be performed. Emergency evacuation procedures from the work area shall also be included in worker training.

C. Supervision Requirements: The Contractor shall provide adequate job supervision for all phases of the asbestos abatement work.

1. The Contractor shall have a NYSDOL job supervisor present on site whenever work described in this Section is in progress. If the job supervisor leaves the site for any reason a qualified and certified supervisor, who meets the requirements of this Section and is familiar with the current status of the work, shall be designated. Brewster CSD Designated Representative shall be informed of the substitution. The supervisor must be familiar and experienced with asbestos removal and its related work, safety procedures, and equipment.

D. Worker Medical Examinations: The Contractor shall provide medical examinations for all employees engaged in asbestos removal and disposal operations, in accordance with OSHA Standards 29 CFR 1910.134(b), 1926.1101, and applicable state regulations. The Contractor shall ensure that all employee examination results are on file in his office and available for review and are maintained in accordance with OSHA Standard 29 CFR 1926.1101 (n) (3).

E. Certificate of Worker's Release: Each asbestos abatement worker, workers of other trades, or any supervisory personnel who enter the work area, or otherwise contact ACM, shall submit a Certificate of Worker's Release, as required in the Section "Submittal".

1.13 TESTING AND INSPECTION REQUIREMENTS AND RESPONSIBILITIES:

Visual inspections and air monitoring will be performed before, during, and after asbestos abatement to document airborne asbestos fiber concentrations as defined in this specification.

A. Brewster CSD Responsibilities:

1. Brewster CSD will employ an Environmental Consultant to perform Project Monitoring and air testing. The project monitor will have the authority to approve the contractor's work, stop the contractor's work and direct the contractor to take corrective actions where required.

2. Area air samples will be collected and analyzed using NIOSH Method 7400. Air samples will be collected during each shift as required by the regulations.

3. Clearance testing by Phase Contrast Microscopy (PCM) will be conducted as per New York State Industrial Code Rule 56 regulations. Air samples will be collected to demonstrate final re-occupancy clearance for work areas within the building. The fiber concentration must comply with the specified clearance level as per New York State Industrial Code Rule 56 and this specification. Brewster CSD will provide for collection and analysis of one round of samples required to demonstrate clearance in each discrete work area.

4. Brewster CSD Environmental Consultant will perform inspections of the work area, as specified, upon request of the Contractor.

B. Contractor's Responsibilities:

1. PCM air samples which fail to meet the re-occupancy clearance standard shall be paid for by the Contractor. Should a delay occur, due to failure(s) of clearance air testing, all associated expenses such as PCM analysis, and the Environmental Consultant's time for additional cleaning and air testing, shall be paid by the asbestos contractor. If results of the air samples are unsatisfactory, recleaning of regulated abatement work area surfaces using wet methods, followed by another drying time period and then collection and analysis of an additional set (both inside and outside work area samples) of clearance air samples is required as per ICR 56 Section 56-9.2. This recleaning/clean-up and sampling process shall be repeated until satisfactory clearance air sampling results have been achieved for all asbestos project non-exempt regulated abatement work areas throughout the entire work site.

2. The Contractor, at his/her expense, shall provide OSHA monitoring and all other all tests required by specified applicable regulations, codes, and standards and any other tests for his/her use. The use of a testing laboratory by Brewster CSD does not release the Contractor from providing tests required for the protection and safety of his/her employees.

3. The Contractor shall employ an independent testing laboratory for analysis of OSHA personal air monitoring samples. The laboratory used for air

sample analysis shall be successfully participating in the "Proficiency Analytical Testing (PAT) Program for Laboratory Quality Control for Asbestos." The monitoring shall be supervised by an Industrial Hygienist certified by the American Board of Industrial Hygiene (A.B.I.H.). Each testing laboratory shall be ELAP (Environmental Laboratory Accreditation Program) and NVLAP (National Voluntary Laboratory Accreditation Program) certified. Brewster CSD shall approve the contractor's testing laboratory.

4. From each work area the Contractor, at his/her expense, shall collect and analyze OSHA personal air monitoring samples. Sampling shall be repeated during each different work activity. Sample collection and analysis shall be performed using the OSHA Reference Method as outlined in 29 CFR 1926.1101, Appendix A.

5. Results of all air monitoring performed by the Contractor shall be posted within 24 hours for regular abatement project after collection for all workers to see. A copy of the results shall be given to the Brewster CSD Environmental Consultant at the same time.

5. The Contractor shall be advised whenever questions arise concerning compliance with standards of quality and completeness of the work, and shall use his/her best efforts to resolve any such questions to the satisfaction of the Brewster CSD Environmental Consultant.

6. Where air monitoring tests and/or inspections are specified, the Contractor shall notify Brewster CSD Environmental Consultant, in writing, 24 hours, in advance of the required test and/or inspection.

8. The Contractor is responsible for ensuring the Work is complete to the level that meets the criteria of the inspection. The Contractor shall perform an inspection of the Work to evaluate completeness prior to requesting an inspection by the Brewster CSD Environmental Consultant.

C. Time Requirements for Brewster CSD Environmental Consultant's Inspections and Testing: Where visual inspections or air testing is required to be performed by the Brewster CSD Environmental Consultant, the Contractor shall allow for the following response/analytical time for completion of the inspection/test.

1. Where visual inspections are required, allow 24 hours, beginning from the time the Contractor's request is received by the Brewster CSD Environmental Consultant, for the performance of the inspection.

2. Where PCM clearance air monitoring tests are required, allow 24 hours, beginning from the time the Contractor's written request is received by the Brewster CSD Environmental Consultant, to the beginning of the air test.

PART 2 - PRODUCTS

2.01 MATERIALS: Materials provided under this section shall be standard products of manufacturers regularly engaged in the production of the items and shall conform to OSHA Standard 29 CFR 1926.1101; EPA Standard 40 CFR 61, Subpart M; Department of Transportation Standards 49 CFR 171, 172, and 173; applicable state regulations; and requirements specified herein. Materials listed under this section "or equal" shall be provided for work under contract.

A. Plastic: Provide fire retardant plastic of 6-mil thickness shall be provided in rolls of sizes which will minimize the frequency of joints. Fire retardant plastic sheet shall be used for plasticizing the enclosed work area, for preparation of the decontamination enclosure system, and for waste packaging.

B. Reinforced Fire Retardant Plastic: Provide reinforced polyethylene sheet for the floor area of the decontamination enclosure system. Reinforced plastic sheet provided for this project shall be a 19 mil, 3-ply, high density flame resistant-reinforced-polyethylene sheet. Plastic color shall be opaque.

C. Duct Tape: Duct tape shall be capable of sealing joints of adjacent sheets of plastic and of attaching plastic sheeting to finished surfaces without damage to existing finish and shall be capable of adhering under both dry and wet conditions, including use of amended water

D. Surfactant: Surfactant (Wetting Agent) shall consist of resin materials in a water base, which have been tested to ensure materials are non-toxic and non-hazardous. Surfactants shall be installed according to the manufacturer's written instructions.

E. Lockdown Encapsulants: Encapsulants used after asbestos removal to lockdown fugitive fibers shall carry a Class "A" fire resistance rating and shall have an ASTM E-162 flame spread index of 15 or less. A tint shall be given to the encapsulant by means of the addition of non-toxic, nonflammable colorings before application. The encapsulant shall be installed according to the manufacturer's written instructions.

F. Caulking Sealant: Caulking sealant shall be single component, non-sag elastomer with 1600% elongation capacity. Sealant shall meet the requirements of Federal Specification TT-S-00230C, Class A Type II. Sealant shall be used to form an airtight seal around plywood barriers or temporary partitions, to seal along the seams of the decontamination enclosure system's plywood sheathing, and to seal

around piping or other small penetrations of the work area. Sealant application shall be according to the manufactures written instructions.

G. Foam Sealant: Foam Sealant shall be expanding urethane Class 1 foam sealant with an Underwriters Laboratories, Inc. (U.L. 723) flame spread index of 25 or less, smoke developed index of 0, and a minimum operating temperature range between -30°F and 250°F.

H. Plywood: Plywood used for temporary partitions, decontamination enclosure systems, and tunnels shall be an exterior grade and a minimum 3/8-inch thick.

I. Spray Adhesive: Spray Aerosol Adhesive shall be specially formulated to stick to sheet polyethylene (3M 76, 3M 77, or equivalent).

J. Other Materials: All other materials, such as lumber, plywood, tools, scrapers, brushes, cleaning materials, adhesive, nails, hardware, etc., which are required to perform the work described in this Section shall be provided. Materials and equipment shall be new or used, uncontaminated by asbestos, in serviceable condition, and appropriate for the intended purpose.

K. Disposal Bags: Plastic Disposal Bags shall be a minimum of six mils in thickness. Bags shall be labeled in accordance with this Section.

L. Shipping Containers: Impermeable Containers shall be suitable to receive and retain any asbestos-containing or asbestos-contaminated materials until they are disposed of at an approved landfill. The containers shall be labeled in accordance with this Section. Containers shall be both airtight and watertight and conform to DOT Standard 49 CFR 178.224. Each container shall be constructed of fiber, hard plastic, or metal, with locking, airtight lids.

M. Markings and Labels: Disposal bags and shipping containers shall bear danger labels, transportation packaging labels, and generator identification information. Labels shall be permanently affixed to all bags and shipping containers containing ACM, in accordance with OSHA Standard 29 CFR 1926.1101(k)(2), DOT Standard 49 CFR Part 171 and 172, and EPA Standard 40 CFR Part 61.150(a)(1)(v).

1. Danger label format and color shall conform to OSHA Standard 29 CFR 1926.200. Danger labels shall display the following legend/information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG
DISEASE HAZARD

2. DOT Marking and Labels: Markings and labels shall be permanently affixed to all bags and containers containing ACM, in accordance with DOT 49 CFR 172.304 and 172.407.

   a. Markings shall display the following text:

      RQ, ASBESTOS, NA 2212

   b. Labels shall be diamond shape and shall be located near the Marking text. Labels will consist of a diamond a minimum of 100 millimeters (mm) on each side with each side having a solid line inner boarder 5.0 to 6.3 mm from the edge. The label shall be white with seven black vertical stripes on the top half. Black stripes and white spaces shall be equally spaced. The lower half of the label shall be white with the class number "9" underlined and centered at the bottom. Refer to DOT 40 172.446 for label format.

3. Generator identification information shall be affixed to each DOT label format and color shall conform to DOT Standard 49 CFR 172.304. Generator identification information labels shall display the following legend/information:

GENERATOR'S NAME
GENERATOR'S 24-HOUR PHONE
GENERATOR'S FACILITY ADDRESS

N. Reuse of Containers: If impermeable containers used to transport bagged asbestos waste to the landfill are to be reused, the empty containers shall display the following label:

RESIDUE:
LAST CONTAINED ASBESTOS RQ

O. Warning Signs: Warning Signs shall be posted at the perimeter of the work area prior to abatement operations in accordance with OSHA Standard 29 CFR 1926.1101. Danger sign format and color shall conform to OSHA Standard 29 CFR 1926.200. The signs shall display the legend indicated below:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE
CLOTHING ARE REQUIRED IN THIS AREA

P. Mastic remover. The contractor shall use an odorless mastic remover. Manufacture and brand of mastic remover shall be approved by the Facility prior to commencing removal work.

2.02 EQUIPMENT: Equipment provided under this section shall conform to applicable federal and state regulations, local codes, and the requirements specified herein.

A. Spraying Equipment: Equipment used to apply amended water or removal encapsulant shall be of a low-pressure type to prevent disturbance of the asbestos prior to physical controlled removal. Airless spray equipment shall be provided for the application of asbestos encapsulant.

B. Vehicles: Trucks or Vans used for the transportation of asbestos waste shall be enclosed and suitable for loading, temporary storage, transit, and unloading of asbestos-contaminated waste without exposure to persons or property.

C. Fall Protection Equipment: Certified and approved equipment to be used by trained personnel when working at elevation to protect against falling from an elevated work area.

D. Fire Extinguisher: Type "ABC" dry chemical extinguisher or a combination of several extinguisher of NFPA recommended types for the fire hazard exposures in each extinguisher location shall be provided. Minimum size of extinguisher shall be 4-A, and 40-B:C. Supply a minimum of one extinguisher for every 1,000 square feet of floor area, with a maximum travel distance to an extinguisher of 75-feet. Supply at least one extinguisher in each decontamination enclosure equipment room, and clean room. Supply 2 additional extinguishers inside the work area

E. Smoke Detectors: Smoke detectors of the battery powered ionization type will be required at a rate of one per 5,000 square feet, with a minimum of one smoke detector in the decontamination enclosure clean room, and one in the work area.

F. Water Filtration System: A system capable of filtering and retaining particles larger than 5.0 microns in size shall be provided.

G. Carts: Provide water tight wheeled carts with tight fitting lids suitable for movement of non-contaminated waste or bagged asbestos waste from the decontamination enclosure system to the waste storage container or transport vehicle.

H. Power Tools: Provide power tools necessary to complete the Work. Power tools used directly for asbestos removal shall be equipped with a dust collection system. Attach a shroud connected to a HEPA vacuum system for capture of dust.

2.03 WORKER PROTECTIVE CLOTHING AND EQUIPMENT: Protective clothing and equipment shall conform to OSHA Standard 29 CFR 1926.1101

A. Protective Clothing: Workers shall be provided with sufficient sets of properly fitting, full-body, disposable coveralls, head covers, gloves, and 18-inch high boot-type foot covers. Disposable coveralls, head covers, and 18-inch high boot-type foot covers shall be constructed of material equal to DuPont "TYVEK-Type 14" or Kimberly-Clark "Kleenguard", as a minimum requirement.

1. The Contractor shall provide authorized visitors and the Brewster CSD Environmental Consultant suitable properly fitting protective disposable clothing, headgear, hard hats, eye protection, respiratory protection, and footwear (up to four sets per 8-hour shift) whenever they are required to enter the work area.

B. Equipment: Eye protection and hard hats required for job conditions or by applicable safety regulations shall be provided.

C. Respiratory Protection: The Contractor shall be solely responsible for providing adequate respiratory protection at all times for all individuals in the work area. Types of respirators used shall be approved by MSHA/NIOSH for asbestos in accordance with OSHA Standard 29 CFR 1926.1101 and 29 CFR 1910.134. The Contractor shall provide a level of respiratory protection which supplies an airborne fiber level inside the respirator below 0.01 fibers per cubic centimeter (f/cc), as the minimum level of protection allowed. Determine the proper level of protection by dividing the actual airborne fiber count in the work area by the "protection factors" given below for each respirator type:

Respirator Type	Protection Factor
Air purifying: Negative-pressure respirator, High efficiency HEPA filter, Half-facepiece	10
Air purifying: Negative-pressure respirator, High efficiency HEPA filter, Full-Facepiece	50 (quantitative)
Powered air purifying (PAPR): Positive pressure respirator High efficiency HEPA filter, Full-facepiece	1000

Type C supplied air: Positive-pressure respirator, Pressure-demand, Full-facepiece HEPA escape	1000
Type C supplied air: Positive-pressure respirator, Pressure-demand, Full-facepiece HEPA escape	1000
Type C supplied air: Pressure-demand, Full-facepiece equipped with an auxiliary SCBA	1000

1. The Contractor shall provide workers with individually issued and marked respiratory equipment. Respiratory equipment shall be suitable for the asbestos exposure level(s) in the work area(s), as specified in OSHA Standard 29 CFR 1926.1101, and as more stringently specified otherwise, herein.

2. During the use of supplied air systems, the Contractor shall provide authorized visitors, Brewster CSD Environmental Consultant, and the testing laboratory representative with individually issued and marked respiratory equipment (up to six units). Respiratory equipment shall be compatible with the supplied air system in use, and shall be suitable for the asbestos exposure level(s) in the work area(s), as specified in OSHA Standard 29 CFR 1926.1101, and as more stringently specified otherwise, herein.

3. Where respirators with disposable filter parts are employed, the Contractor will provide sufficient filter parts for replacement as necessary or as required by the applicable regulation.

4. Breathing air supply systems shall conform to the USEPA NIOSH Document EPA-560-OPTS-86-001 (September 1986) entitled "A Guide to Respiratory Protection for the Asbestos Abatement Industry."

5. The Contractor shall have a minimum of two spare air hoses with connectors to permit the Brewster CSD Environmental Consultant or testing laboratory's representative to connect his/her assigned Type C respirator to the air system at <u>any time</u> without having to wait for personnel to exit the work area in order to obtain a spare hose.

PART 3 - EXECUTION

3.01 DECONTAMINATION ENCLOSURE SYSTEMS:

A. Personal Decontamination System Enclosures: shall be constructed and functional prior to commencing the regulated abatement work area preparation activities. Waste decontamination system enclosures shall be constructed and functional at the completion of preparation activities. After installation of the personal decontamination system enclosure, all access to the regulated abatement work area shall be via the installed personal decontamination system enclosure.

B. Personal Decontamination System Enclosure - Large Project.

(1) Enclosure – General. A personal decontamination system enclosure shall be provided outside the regulated abatement work area and in close proximity to all locations where personnel shall enter or exit the regulated abatement work area. One personal decontamination enclosure system for each regulated abatement work area shall be required. This system may utilize adequate existing lighting sources separate from the decontamination system enclosure, or shall be supplied with a GFCI protected temporary lighting system. The personal decontamination system enclosure shall be sized to accommodate the number of workers and equipment required for the intended purpose. Such system may consist of existing attached rooms outside of the regulated abatement work area, if the layout is appropriate, that can be plasticized and are accessible from the regulated abatement work area. When this situation does not exist, personal decontamination enclosure systems may be constructed of metal, wood or plastic supports covered with fire-retardant plastic sheeting. A minimum of one (1) layer of six (6) mil fire-retardant plastic sheeting shall be installed on the ceiling, and walls of the enclosure system. At least two (2) layers of six (6) mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of this area. This system must be kept clean, sanitary and climate controlled at all times in conformance with all federal, state and local government requirements. This system shall remain on-site, operational and be used until completion of Phase II C of the asbestos project.

(2) Rooms and Configuration. The personal decontamination system enclosure shall consist of a clean room, a shower room and an equipment room connected in series but separated from each other by airlocks. There shall be a curtained doorway separation between the equipment room and the regulated abatement work area, and there shall be a lockable door to the outside. (See Figure 1 within ICR 56) Minimum dimensions for each airlock, shower room and equipment room shall be three (3) feet wide by

six (6) feet in height, to allow for adequate access to and from the regulated abatement work area.

(3) Curtained Doorway. An assembly which consists of at least three (3) overlapping sheets of six (6) mil fire retardant plastic over an existing or temporarily framed doorway. One sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to insure that the sheets hang straight and maintain a seal over the doorway when not in use.

(4) Framing. Enclosures systems accessible to the public shall be fully framed, hard-wall sheathed and utilize a lockable door for safety and security.

(5) Sheathing. A plywood or oriented strand board (OSB) sheathing material of at least 3/8-inch thickness.

(6) Plastic Sheeting. Enclosure systems constructed at the work site shall use at least one (1) layer of six (6) mil fire-retardant plastic sheeting on walls and ceiling. At least two (2) layers of six (6) mil fire-retardant reinforced plastic sheeting shall be used for floor protection of this area.

(7) Prefabricated or Trailer Units. A completely watertight fiberglass or marine painted prefabricated unit does not require plasticizing. Rooms shall be configured as per paragraph (2) of this Section. All prefabricated or trailer decontamination units shall be kept in good condition, and shall be completely decontaminated after final cleaning and immediately prior to clearance air sampling. Upon receiving satisfactory clearance air results, the prefabricated units shall be sealed then separated from the regulated abatement work area and removed from the site.

(8) Clean Room. The clean room shall be sized to accommodate a full workshift of asbestos abatement contractor personnel, as well as the air sampling technician and the project monitor. The clean room shall be a minimum of six (6) feet in height. A minimum of thirty-two (32) square feet of floor space shall be provided for every six (6) full shift abatement workers, calculated on the basis of the largest work shift. If the largest work shift consists of three (3) or less full shift abatement workers, the minimum clean room size requirement is reduced to twenty-four (24) square feet of floor space. Benches, lockers and hooks shall be provided for street clothes. Shelves for storing respirators shall be provided. Clean clothing, replacement filters for respirators, towels and other necessary items shall be provided. The clean room shall not be used for storage of tools, equipment or materials. It shall not be used for office space. A lockable door shall be provided to permit access to the clean room from outside the regulated

abatement work area or enclosure and shall be used to secure the regulated abatement work area and decontamination enclosure during non-work hours.

(9) Shower Room. The shower room shall contain one (1) shower per every six (6) full shift abatement workers, calculated on the basis of the largest work shift. Multiple showers shall be simultaneously accessible (installed in parallel) to certified personnel. Each showerhead shall be supplied with hot and cold water adjustable at the tap. The shower enclosure shall be constructed to ensure against leakage of any kind. Uncontaminated soap, shampoo and towels shall be available at all times. Shower water shall be drained, collected and filtered through a system with at least 5.0-micron particle size collection capability. Submersible pumps shall be installed, maintained and utilized in accordance with pertinent OSHA regulations and manufacturer's recommendations. A multi-stage filtering system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtering system by larger particles. Filtered wastewater shall be discharged in accordance with applicable codes. Contaminated filters shall be disposed of as asbestos-contaminated waste.

(10) Equipment Room. The equipment room shall be used for the storage of decontaminated equipment and tools. A one (1) day supply of replacement filters for HEPA-vacuums and negative pressure ventilation equipment in sealed containers, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement project may also be stored here. A container lined with a labeled, at least six (6) mil plastic bag for collection of clothing shall be located in this room. Contaminated footwear and work clothes shall be stored in this area.

(11) Airlocks. Airlock construction shall consist of two (2) curtained doorways with three (3) alternating six (6) mil fire retardant polyethylene curtains per doorway, separated by a distance of at least three (3) feet, such that one passes through one doorway into the airlock, allowing the doorway sheeting to overlap and close off the opening before proceeding through the next doorway. Minimum airlock size shall be three (3) feet wide, by three (3) feet long, by six (6) feet in height.

C. Personal Decontamination System Enclosure - Small Project

(1) Enclosure Requirements. A personal decontamination system enclosure for a Small asbestos project shall consist of, at a minimum, an equipment room, a shower room and a clean room separated from each other and from the regulated abatement work area and other areas by curtained doorways as defined in ICR 56 Section 56-2.1. All other provisions for personal decontamination system for a Large asbestos project shall apply. Equipment

storage, personal gross decontamination and removal of clothing shall occur in the equipment room just prior to entering the shower. (See Figure 4 in the ICR 56) The full personal decontamination system enclosure specified for Large asbestos projects is recommended.

D. Remote Personal Decontamination System Enclosure: If a personal decontamination system cannot be attached to the regulated abatement work area, due to available space restrictions or other building and fire code restrictions, a remote personal decontamination system enclosure may be used for limited Special Projects as per subpart 56-11, negative pressure tent enclosure work areas with glovebag only abatement, or if non-friable ACM is being removed in a manner which will not render the ACM friable.

Limitation. If it is found during removal, that the non-friable ACM or asbestos material will become friable during the removal process, and it is logistically possible to attach the decontamination system enclosure, abatement work must stop immediately while the remote personal decontamination system is relocated to be attached and contiguous to the regulated abatement work area.

The following requirements apply for all remote personal decontamination systems:

(1) Protective Clothing. Workers shall don two (2) sets of disposable protective clothing and a supply of protective clothing shall be kept in the airlocks attached to the regulated abatement work area.

(2) Location. The remote personal decontamination system shall be constructed as close to the regulated abatement work area as physically possible. If the remote personal decontamination system must be located at the exterior of the building/structure due to space or code restrictions, it shall be constructed within fifty (50) feet of the building/structure exit used for access by the asbestos abatement contractor personnel. The decontamination unit shall be cordoned off at a distance of twenty-five (25) feet to separate it from public areas.

(3) Airlocks. At a minimum, two (2) extra airlocks as defined in ICR 56 Section 56-2.1 shall be constructed as per ICR 56 Section 56-7.5(b)(11). One shall be constructed at the entrance to the equipment room or equipment/washroom. The other extra airlock shall be constructed at the entrance to the containment or regulated abatement work area(s). These airlocks shall have lockable doorways at the entrance to the airlock from uncontaminated areas. These airlocks shall be cordoned off at a distance of twenty-five (25) feet and appropriately signed in accordance with ICR 56 Section 56-7.4(c). Airlocks shall not be used as a waste

decontamination area and shall be kept clean and free of asbestos containing material.

(4) Designated Pathway. The walkway from the regulated abatement work area to the personal decontamination system or next regulated abatement work area shall be cordoned off and signage installed as per ICR 56 Section 56-7.4(c), to delineate it from public areas while in use during Phase IIA through IID.

(5) Travel Through Uncontaminated Areas. If at any time a worker must travel through an uncontaminated area to access the personal decontamination area, the worker shall HEPA-vacuum and/or wet wipe his/her outer protective clothing while in the regulated abatement work area, then proceed into the airlock, which serves as a changing area, where he/she shall remove the outer clothing and don a clean set of protective clothing. The worker may then proceed to the personal decontamination system enclosure only along a designated pathway as described above. Travel in any other area shall not be allowed.

(6) Removal. The remote personal decontamination unit shall be removed only after satisfactory clearance air sampling results have been achieved.

E. Waste Decontamination System Enclosure - Large and Small Asbestos Projects.

(1) Enclosure – General. A waste decontamination system enclosure shall be provided outside the regulated abatement work area and shall be attached to the regulated abatement work area. One (1) waste decontamination enclosure for each regulated abatement work area shall be required. This system may utilize adequate existing lighting sources separate from the decontamination system enclosure, or shall be supplied with a GFCI protected temporary lighting system. The waste decontamination system enclosure shall be sized to accommodate the number of workers and equipment for the intended purpose. Such system may consist of existing attached rooms outside of the regulated abatement work area, if the layout is appropriate, that can be plasticized and are accessible from the regulated abatement work area. When this situation does not exist, enclosure systems may be constructed of metal, wood or plastic supports covered with fire-retardant plastic sheeting. A minimum of one (1) layer of six (6) mil fire-retardant plastic sheeting shall be installed on the ceiling, and walls of the enclosure system. At least two (2) layers of six (6) mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of this area. This system must be kept clean, sanitary and climate controlled at all times in

conformance to all federal, state and local government requirements. This system shall remain and be used until completion of Phase II C of the asbestos project.

(2) Rooms and Configuration. A waste decontamination system enclosure shall consist of a washroom and a holding area connected in series but separated from each other by an airlock. There shall be a lockable door to the outside, and there shall be a curtained doorway between the washroom and the regulated abatement work area. (See Figure 2 in the ICR 56).

(3) Curtained Doorway. An assembly which consists of at least three (3) overlapping sheets of six (6) mil fire retardant plastic over an existing or temporarily framed doorway. One (1) sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to insure that the sheets hang straight and maintain a seal over the doorway when not in use.

(4) Washroom. A room/chamber between the regulated abatement work area and the holding area in the waste decontamination system enclosure, where equipment and waste containers are wet cleaned or HEPA-vacuumed. Adequate drainage and bag/container wash water shall be provided within the room/chamber, as well as a sufficient quantity of clean waste bags/containers.

(5) Equipment/Washroom Alternative. Where there is only one (1) exit from the regulated abatement work area, the holding area of the waste decontamination system enclosure may branch off from the equipment room of the personal decontamination system enclosure. The equipment room will also be used as a waste washroom. (See Figure 3 in the ICR 56).

(6) Plastic Sheeting. Waste decontamination system enclosures constructed at the work site shall use at least one (1) layer of six (6) mil fire-retardant plastic sheeting on walls and ceiling. At least two (2) layers of six (6) mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of these areas.

(7) Enclosure Security. The waste decontamination system enclosure and regulated abatement work area airlock(s) (when remote decontamination systems are used) shall be constructed with lockable doors to prevent unauthorized entry. Enclosures systems located within twenty-five (25) feet of an area of public access shall be fully framed and hard-wall sheathed for safety.

(8) Drains. The waste washroom shall be equipped with a wash bin of sufficient size to perform waste container washing operations and shall have a submersible pump installed to collect waste water and deliver it to the shower wastewater filtration system where it shall be filtered in accordance with paragraph (b)(9) of this Section.

(9) Shower/Washroom Alternative - Small Asbestos Project. For Small asbestos projects with only one (1) exit from the regulated abatement work area, the shower room may be used as a waste washroom. The clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall be immediately removed from the enclosure. Waste shall be transferred only during times when the showers are not in use. (See Figure 4 in this Section)

F. Waste Decontamination System Enclosure: When Remote Personal Is Allowed. When a remote personal decontamination system enclosure is allowed and utilized for a regulated abatement work area, the following requirements shall apply:

(1) Minor Size Regulated Abatement Work Area. No specific waste decontamination system enclosure is required for minor size regulated abatement work areas. The waste generated shall be immediately bagged/containerized within the regulated abatement work area.

(2) Small & Large Size Regulated Abatement Work Areas.

(i) Washroom. An additional chamber shall be constructed within the regulated abatement work area, attached to the existing airlock used to access the work area. The washroom/airlock combination shall be utilized as the contiguous waste decontamination enclosure for waste bagging/containerization and waste transfer activities. The washroom shall be constructed and supplied with equipment/materials consistent with waste decontamination system enclosure washroom requirements for contiguous personal and waste decontamination system enclosures.

(ii) Removal. The washroom chamber shall be removed only after satisfactory clearance air sampling results have been achieved.

3.02 PERSONNEL PROTECTION AND DECONTAMINATION PROCEDURES:

A. General: The Contractor shall take all safety measures and precautions necessary to protect his/her employees and building occupants in accordance with OSHA Standard 29 CFR 1926, EPA Standard 40 CFR, Part 61, Subpart M, and applicable state and city regulations. The Contractor shall be solely responsible for enforcing personnel protection requirements.

1. After the installation of the personal decontamination system, full PPE in compliance with current OSHA regulations shall be worn in regulated abatement work areas during preparation activities, for all friable OSHA Class I or Class II asbestos projects. Asbestos abatement contractor's respirator selection, filter selection, medical surveillance and respiratory training must be consistent with current OSHA regulations. Appropriate respiratory protection is also required of all authorized visitors.

2. Workers or authorized visitors shall not eat, smoke, drink, or chew gum or other substances while in the work area(s) or decontamination area(s).

3. Contaminated worker footwear, eye protection, and hard hats shall be stored in the equipment room when not in use in the work area and, upon completion of asbestos abatement, disposed of as asbestos-contaminated waste or decontaminated for reuse.

4. Entry to the personal and waste decontamination system enclosures shall be restricted to the asbestos contractors involved with the asbestos project, appropriately certified employees of the asbestos contractors, authorized visitors, police, fire and other public safety personnel.

5. Asbestos workers shall not wear any jewelry; e.g. watch, necklace, etc. while in the work area or decontamination area.

B. **Worker Respiratory Protection:** With approval from the Brewster CSD Environmental Consultant, historical airborne fiber level data may serve as the basis for selection of the level of respiratory protection to be used for the time interval prior to the Contractor establishing the eight-hour time weighted average (TWA) for an abatement task. Historical data provided by the Contractor shall be based on OSHA personal air monitoring of the "breathing zone" of his/her employees for other asbestos abatement projects, and the data were obtained during work operations conducted under work place conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the Contractor's current operations. Documentation of aforementioned results shall be presented to the Brewster CSD Environmental Consultant for review of applicability. (See "Submittal, Pre-Project Information." This will not relieve the Contractor in providing personal air monitoring to determine the TWA for the work under contract. The TWA shall be determined in accordance with 29 CFR 1926.1101. After the TWA is established, the Contractor may provide respirators as presented in the Specification. The minimum level of protection for TSI and/or Surfacing Materials abatements is full face-piece Powered Air Purifying Respirator (PAPR).

1. Review safety data sheets (SDS) for products to be used during the work. Follow recommendations as given by the product manufacturer for personnel protection required to be worn during product application.

2. Personal Air Monitoring Requirements: The Contractor's CIH shall be responsible for development and implementation of a personal air monitoring program in accordance with OSHA Standard 29 CFR 1926.1101, good industrial hygiene practices, and the requirements herein. Personal air monitoring shall be performed by an independent testing laboratory and supervised by the Contractor's CIH. Documentation of air sampling shall include as a minimum, calculations of minimum sample volume to achieve necessary detection limits; sampling time; sampling location (or subject); evidence of periodic inspection of sampling equipment; documentation of daily pre- and post-calibration of sampling equipment; detailed description of worker protective devices; description of any typical environmental conditions; and a description of work practices/procedures/controls in operation during the sampling period. Documentation of sample analysis shall include, as a minimum, sample identification; total sample duration, sample flow rate; the "Limit of Reliable Quantification"; total air volume; total fibers counted (with work sheets); total fields counted; blank filter analysis; and reticule field area. Airborne fiber concentrations in fibers per cubic centimeter (f/cc) shall be calculated and reported at the 95 percent confidence level.

3. Full-shift personal exposure air sampling of workers shall be performed to establish the 8-hour (TWA) exposure. Such sampling shall be conducted for each employee (or representative group of employees, at least one sample per eight-man crew) expected to evidence the highest exposure in each work area for each type of activity on the first shift that site preparation, removal, or cleanup activities occur. Similarly, 30-minute personal exposure air sampling shall be conducted during activities anticipated to produce the highest airborne concentrations to determine the Excursion Limit. Personal exposure sampling shall be repeated everyday as per protocol requirements where removal and cleanup operations are conducted for the duration of the project, or at any time that conditions indicate to the Contractor or the Contractor's CIH that the most recent personal sampling results are no longer indicative of employee exposure. PCM personal samples shall be collected and analyzed according to the OSHA Reference Method in OSHA Standard 29 CFR 1926.1101, Appendix B.

C. Personnel Entrance and Decontamination Procedures for Gross Removal Operations Utilizing Exterior Project Removal of Non-friable ACM Roofing, Siding, Caulking, Glazing Compound, Transite, Tars, Sealers, Coatings, and Other NOB ACMs methods:

1. All workers and authorized visitors shall enter the work area through the worker decontamination enclosure system.

2 All individuals who enter the work area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each work area and worker respiratory protection employed. The site supervisor shall be responsible for the maintenance of the log during the abatement activity.

3 Each worker or authorized visitor shall, upon entering the job site, remove street clothes in the clean room and put on a clean respirator (with new filters, if appropriate) and clean protective clothing before entering the work area through the shower room and equipment room.

4 Each worker or authorized visitor shall, each time he/she leaves the work area: remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove all clothing except the respirator; still wearing the respirator, proceed to the shower room; clean the outside of the respirator with soap and water while showering; remove filters, wet them, and dispose of them in the container provided for that purpose; wash and rinse the inside of the respirator; and thoroughly shampoo and wash himself/herself.

5 Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately. Disposable clothing of the type worn inside the work area is not permitted outside the work area.

3.03 PREPARATION OF WORK AREA: The following Paragraph "General Preparations" outlines procedures applicable to all work areas. Work procedures specific for preparing each asbestos removal area is addressed in its respective Subparagraph. If a site specific variance is approved, procedures outlined in the variance will supercede this specification.

A. General Preparations: The following general preparations shall be used for all work areas being abated:

1. Erect barricades; post notices and warning signs.

2. Provide and install decontamination enclosure systems in accordance with Article 3.01, "Decontamination Enclosure Systems" of this Section.

3. Seal drains and other collection devices with 6-mil plastic and plywood, as necessary, and provide a system to collect all water used by the Contractor. Collected water shall be passed through a water filtration system prior to being discharged into the sanitary sewer.

4. Ensure that the Contractor's approved Fall Protection Equipment (if applicable) is in place, in operating condition, and in operation during work described in this section.

5. Maintain emergency and fire exits from the work areas or establish alternative exits satisfactory to the local fire officials. Emergency exits and routes shall be established and clearly marked with florescent paint or other effective designations to permit easy location from anywhere within the work area. Emergency exits shall be secured to prevent access from uncontaminated areas and yet permit emergency exiting. Exits shall be checked daily against exterior blockage or impediments to exiting.

6. Temporary lighting within the work area and decontamination system shall be provided as required to achieve minimum illumination levels.

7. Hand power tools used to drill, cut into, or otherwise disturb ACM shall be equipped by manufacture with HEPA filtered local exhaust ventilation.

8. Hot and cold water may not be available in all work areas. In such cases sufficient heating equipment shall be provided to maintain a necessary supply of hot water for showers.

B. Exterior Project Removal of Non-friable ACM Roofing, Siding, Caulking, Glazing Compound, Transite, Tars, Sealers, Coatings, and Other NOB ACMs methods:

1. **Establishment and Isolation of Regulated Abatement Work Area.** The immediate work area shall be considered to be the area from which the asbestos containing materials are actively being removed. The asbestos project regulated abatement work area shall extend twenty-five (25') feet from the perimeter of the immediate work area and shall have signage in accordance with Section 56-7.4. An airlock shall be required at the entrance to the regulated abatement work area to serve as a changing area, if the workers shall have to pass through enclosed publicly occupied space, such as from a roof through an interior stairway, to access the decontamination units.

a. Where the asbestos project regulated abatement work area extends outward twenty-five (25) feet and extends downward one (1) floor to encompass a passage or vehicular door which must be used for either a primary entrance or by an emergency vehicle, thereby precluding sealing such door, a tunnel structure (with sides and roof) built of plywood sheeting, covered with at least two (2) layers of at least six (6) mil plastic, shall extend outward twenty-five (25) feet horizontally from the line of vertical projection of the roof edge downward to grade level

2. **Preliminary Preparation.** Regulated abatement work area preparation shall also comply with Sections 56-7.2, 7.3, 7.4, 7.5, 7.6, 7.7 and 7.9 of NYS DOL 12 NYCRR Part 56.

3. **Decontamination System Location.** The personal and waste decontamination system enclosures can be remote but must be within fifty (50) feet of the building/structure entrance used by the asbestos handlers (workers), and shall be removed only after obtaining satisfactory clearance air results for the regulated abatement work area or an acceptable visual inspection has determined that the abatement is complete, as per Section 56-9. 2(e) of NYS DOL 12 NYCRR Part 56.

4. **Critical Barriers.** Prior to the placement of critical barriers, affected surfaces shall be pre-cleaned using HEPA-filtered vacuum equipment and wet cleaning methods. All openings within the regulated abatement work area shall be sealed with critical barriers installed as per Section 56- 7.11(a), prior to beginning Phase II B activity on the project. The critical barriers shall be removed only after satisfactory clearance air sampling results have been obtained or the asbestos project is complete. The requirements of Section 56-7.11(b-e) of NYS DOL 12 NYCRR Part 56 do not apply. Additional requirements are as follows:

Roofs:

All openings (including operable windows, doors, ducts, grilles, communicating openings, etc.) one (1) story above and one (1) story below the roof level of the regulated abatement work area (this includes any building/structure within twenty-five (25) feet of the immediate work area)**,** shall be sealed directly with two (2) layers of at least six (6) mil flame-retardant plastic sheeting. All vent openings which cannot be sealed shall be extended vertically a minimum of eight (8) feet and remain in operation.

A polyethylene drape or curtain may be used instead of plasticizing the windows individually. The drape may be removed after the asbestos project is complete.

The drape or curtain, if used, shall be made of two (2) layers of a continuous eighteen (18) foot curtain (drape) of at least six (6) mil plastic hung from the top of the wall or parapet. The plastic curtain shall be secured using nailer strips and ram set charges or other methods approved by the building/structure owner's authorized representative. The bottom of the plastic curtain shall be sufficiently weighted or anchored to prevent lifting due to winds. Curtain seams shall overlap at least twelve (12) inches and be sealed with duct tape front and back. The curtain ends and each seal shall be reinforced by stapling furring strips to the plastic. The plastic curtain shall extend a minimum of fifteen (15) feet beyond the last opening within twenty-five (25) feet of the regulated abatement work area. When removed, the plastic curtain shall be disposed of as asbestos waste.

Any windows on the floor below or above and within twenty-five (25) feet of the immediate work area need to be plasticized, but if safety reasons dictate, they may be plasticized from inside the building/structure.

Any fixed or non-operable windows on the floor below or above and within twenty-five (25) feet of the immediate work area need not to be plasticized, but shall be sealed using caulking or duct tape.

Facades:

Removals without tents will require plasticizing or sealing of nearby windows within twenty-five (25) feet of the immediate work area, placement of dropcloths, plasticizing of a man-lift or scaffolding and other operational safeguards as outlined below.

For larger work area removals, any operable windows or openings to the building at the work level or on the floor below within twenty- five (25) feet of the immediate work area shall be plasticized with two (2) layers of six (6) mil fire retardant polyethylene sheeting. The windows can be plasticized outdoors, or for reasons of safety, from the indoors. Window, door and louver units subject to complete removal must have their openings plasticized at the interior of the building. Windows that are fixed or non-operable and that will remain sealed airtight for the duration of abatement activities, do not require installation of critical barriers.

Under areas where non-friable materials are removed without tents, a dropcloth, made of six (6) mil fire retardant polyethylene sheeting, shall be placed on the ground below the work area to prevent spread of any ACM remnants. This dropcloth shall be a minimum of ten (10) feet wide with an additional ten (10) feet of width for every floor above a 1st floor level where removal work will take place, up to a maximum of thirty (30) feet of width measured perpendicular to the building/structure. In addition, if a straight scaffolding, man-lift, swing scaffolding or similar equipment is used for areas above the 1st floor, the lift/scaffolding unit shall be plasticized with two (2) layers of six (6) mil fire retardant polyethylene on the platform, with plastic sheeting extended vertically to waist-high (as so equipped) guardrail sides and back of the lift unit. While the platform/lift walking surfaces must be plasticized, the asbestos abatement contractor must provide proper traction surfaces or equipment to assure the safety and comfort of abatement workers while performing abatement activities on the lift/scaffold equipment. After non-friable ACM is removed from each work location, the platform and plasticized surfaces toward the building shall be wet wiped and/or HEPA vacuumed clean before reuse. The plasticizing on the lift or scaffolding shall be periodically inspected during use and repaired as needed.

3.04 PRE-REMOVAL INSPECTIONS:

A. Prior to removal of any ACM the Contractor shall notify the Brewster CSD Environmental Consultant and request a pre-removal inspection. Posting of warning signs, plasticizing of work area, building of decontamination enclosure systems, and all other preparatory steps have been taken prior to notification of Brewster CSD Environmental Consultant. The Contractor shall not begin asbestos removal until the Brewster CSD Environmental Consultant approves the work area preparations.

3.05 MAINTENANCE OF CONTAINED WORK AREA AND DECONTAMINATION ENCLOSURE SYSTEMS:

A. Repair damaged barriers and remedy any defects immediately upon their discovery. Visually inspect barriers at the beginning and end of each work period.

B. Visually inspect non-Work Areas and the decontamination enclosure system for water leakage. Check the floor below, ceiling and walls, and view beneath/or around the decontamination enclosure system, for signs of leakage. Perform the visual inspection a minimum of twice each 8- hour work shift.

C. Ensure that both hot and cold water exist in sufficient supply for the decontamination enclosure system.

3.06 REMOVAL OF ASBESTOS-CONTAINING MATERIAL: The Asbestos Contractor shall be responsible for the proper removal of ACM from the Work Area using standard abatement industry removal techniques. The Environmental Consultant or their representative shall observe the Work. Approval of the Asbestos Contractor's abatement techniques is required by the Environmental Consultant to allow for the continuance of work.

A. Exterior Project Removal of Non-friable ACM Roofing, Siding, Caulking, Glazing Compound, Transite, Tars, Sealers, Coatings, and Other NOB ACMs methods:

Removal of ACM shall utilize manual wet methods for all non-friable ACM removals, and rotating blade roof cutters for roofing removals, as applicable. In no event shall methods be used that may render the ACM friable.

1. Residual non-friable ACM shall be wet scraped and HEPA vacuumed. Materials removed shall be containerized or immediately wrapped in two (2) layers of six (6) mil fire retardant plastic sheeting and secured air tight prior to transport to the waste decontamination facility.

2. Under façade areas where non-friable ACM is to be removed without tents, whenever possible, an asbestos handler (worker) with a HEPA vacuum will position the vacuum hose within four (4) inches of the material being removed to capture small pieces of non-friable ACM and asbestos fines. The hose end will be positioned so that as many smaller pieces of material as possible will fall into the vacuum hose end. Larger pieces of ACM should be immediately bagged or containerized.

3. Asbestos containing materials will not be allowed to accumulate in the work area or on the drop cloth.

4. In lieu of using an exterior chute as per Section 8.4(g) of NYS DOL 12 NYCRR Part 56, waste bags and containers may be lowered to the waste trailer/dumpster by crane or hoist using a temporary waste transfer container of adequate size and strength.

3.07 ACM WASTE PACKAGING AND LOAD OUT PROCEDURES:

A. Packaging of ACM shall conform to OSHA Standard 29 CFR 1926.1101, DOT 49 CFR 171,172, and 173, EPA Standard 40 CFR Part 61, New York City Department of Sanitation (in relation to transport, storage, and disposal of ACM) and the

requirement as heretofore specified. ACM waste shall be placed in a wet condition into properly labeled disposal bags or sealed in two layers of 6-mil plastic sheeting wrapped airtight and properly labeled. Materials to be transported through a non-Work Area building space shall be placed in hard wall shipping containers for handling. Specific requirements for decontamination of waste containers, and load out through the decontamination enclosure systems is outlined below:

B. Frequency of Waste Removal: Properly packaged and labeled asbestos waste shall be removed from the site on a daily basis. Under no circumstance shall asbestos waste be stored on site. The waste hauler and landfill shall be as indicated on the notifications to regulatory agencies.

C. Waste Load-out Through Waste Decontamination Unit: Place asbestos waste in disposal bags. Large items not able to fit into disposal bags shall be wrapped in one layer of 6-mil thick plastic sheeting. Clean outer covering of asbestos waste package by wet cleaning and/or HEPA vacuuming in a designated part of the Work Area. Move wrapped asbestos waste to the washroom, wet clean each bag or object and place it inside a second disposal bag, or a second layer of 6-mil plastic sheeting, as the item's physical characteristics demand. Air volume shall be minimized, and the bags or sheeting shall be sealed airtight with tape.

D. The clean containerized items shall be moved directly to the Waste Hauler's truck pending load-out to storage or disposal facilities.

E. Workers who have entered the decontamination enclosure system from the uncontaminated non-work area shall perform load-out of containers from the decontamination enclosure holding area. Dress workers transporting asbestos waste to storage or disposal facilities in clean overalls of a color different than from that of coveralls used in the Work Area. Ensure that workers do not enter from uncontaminated areas into the equipment washroom or the Work Area. Ensure that contaminated workers do not exit the Work Area through the equipment decontamination enclosure system.

F. Thoroughly clean the decontamination enclosure system immediately upon completion of the waste load-out activities, and at the completion of each work shift.

G. Labeled ACM waste containers or bags shall not be used for non-ACM debris or trash. Any materials placed in labeled containers or bags, whether turned inside out or not, shall be handled and disposed of as ACM waste.

3.08 <u>CLEANUP AND CLEARANCE TESTING OF WORK AREAS</u>: The following clean-up procedures shall be performed during abatement.

A. Exterior Project Removal of Non-friable ACM Roofing, Siding, Caulking, Glazing Compound, Transite, Tars, Sealers, Coatings, and Other NOB ACMs methods:

1. **Clean-Up Procedures During Abatement.** The following clean-up procedures shall be performed during abatement.
   a. Visible accumulations of loose asbestos containing waste material shall be cleaned up using rubber or plastic dustpans and rubber squeegees or HEPA filtered vacuums. Metal shovels may also be used, except in the vicinity of plastic sheeting, critical barriers and isolation barriers, which could be perforated by these tools. To pick up excess water and gross wet debris, a wet-dry HEPA filtered shop vacuum dedicated to asbestos abatement may be used. This cleaning shall be done whenever there is sufficient asbestos waste material to fill a single leak-tight bag/container, or this cleaning shall be done at the end of each work shift whichever shall occur first. Visible debris shall be maintained adequately wet.

   b. Work shall stop whenever excessive water accumulation or flooding is present in the area and shall not resume until the water is collected and disposed of properly.

2. **Final Cleaning and Clearance Procedures.** Final clean-up and clearance procedures for abatement shall comply with Section 56-9 of NYS DOL 12 NYCRR Part 56, except that only one (1) stage of cleaning (final) is to be performed. Lockdown encapsulant use is not required.

   a. **Exemption from Project Monitor Visual Inspection.** Asbestos projects which are exempt from clearance air sampling requirements at one or two- family owner occupied residential buildings/structures, are also allowed an exemption from the project monitor visual inspection requirements. For asbestos projects utilizing this exemption, once final cleaning is complete, a visual inspection shall be completed by the asbestos abatement contractor's supervisor to confirm that the scope of abatement work for the asbestos project is complete, and no visible debris/residue, pools of liquid, or condensation remain. The results of this inspection shall be documented by the asbestos abatement contractor's supervisor in the asbestos abatement contractor daily project log, and once the asbestos project is complete the asbestos abatement contractor's supervisor shall also obtain the owner's written acceptance of the final results of the asbestos project within the daily project log.

3.09 DISPOSAL AND TRANSPORTATION OF ASBESTOS-CONTAMINATED WASTE:

A. Storage of Containerized ACM: As the work progresses, remove sealed and labeled bags of ACM from the Work Area and place in a lockable trailer, dumpster, or other container approved for storage or transport of asbestos waste. The waste container shall be lined with two layers of 6-mil fire retardant plastic on all sides. Asbestos-containing waste shall remain under the positive control of the Asbestos Contractor and must never be left unattended in an area or on a vehicle where unauthorized persons could gain access. Containerized ACM shall be removed from the site on a daily basis. Unless specifically approved in writing by the Owner, ACM shall not be permitted to be stored on site during non-working hours.

B. Sealed and labeled bags or waste wrapped in two layers of plastic sheeting sealed airtight shall be used to transport asbestos-contaminated waste to the landfill. Procedures for hauling and disposal shall comply with 40 CFR, Part 61, 49 CFR, Part 171 and 172, and other applicable state, regional, and local government regulations. Procedures for removal from the Work Area and disposal of waste are outlined below:

C. A properly completed and original "Waste Shipment Record" form shall accompany asbestos waste, which is transported to a disposal site. This form shall be signed and dated by each party who has control over the asbestos waste, and a copy retained by each party as responsibility for the waste is transferred to the next party. All original manifest forms and waste receipts shall be provided to the Architect. The Environmental Consultant shall be provided with copies of all waste manifests.

D. Trucks hauling asbestos waste shall be totally enclosed to prevent loss or damage to waste container en-route to approved landfill. The interior of the vehicles shall be lined with two layers of 6-mil plastic.

E. Mark with a visible warning sign during the loading and unloading of asbestos-containing waste all vehicles used to transport the waste material. Danger sign legend, text size, style and arrangement shall conform to the requirements of EPA Standard 40 CFR Part 61.149 (d) (I).

F. Only sealed plastic bags or completely sealed items shall be deposited in landfill. Damaged, broken sealed windows or leaking plastic bags shall be resealed prior to being deposited in the landfill. Workers shall place asbestos waste in the landfill. Throwing or dumping of containers shall not be allowed. Workers unloading and handling the sealed bags/drums at the disposal site shall wear appropriate personnel protective equipment including respirators and protective clothing.

G. After the vehicle is unloaded at the landfill, the plastic sheeting that was taped to

the floor, sides and top of the truck shall be carefully removed and placed in properly labeled bags for disposal with the rest of the waste.

END OF SECTION

LIST OF SUBMITTALS

	SUBMITTAL APPROVED	DATE SUBMITTED	DATE
Pre-Project Submittal:			
1.	Insurance	_____	_____
2.	All required bonds	_____	_____
3.	List of Subcontractors	_____	_____
4.	Health and Safety Plan	_____	_____
5.	Proof that all required permits and variances have been obtained	_____	_____
6.	Documentation of Required Qualifications of Workers	_____	_____
7.	Proof of a respiratory protection program.	_____	_____
8.	Proof of historic airborne fiber data.	_____	_____
9.	Proof that a landfill site has been located.	_____	_____
10.	SDS of chemicals to be used on this project.	_____	_____
11.	Asbestos Removal and Disposal Work Plan	_____	_____
During Work Submittal:			
1.	Schedule of Work Changes	_____	_____
2.	Notarized copy of weekly payroll showing a prevailing wage rate has been paid.	_____	_____
3.	A "Request For Services" form.	_____	_____
4.	Results of all air monitoring performed by the Contractor (OSHA)	_____	_____

5.	A certified, signed, and completed copy of each " Waste Shipment Record" form (Section 1.07)	_____	_____
6.	A copy of the bound log book	_____	_____

Post Project Submittal:

1.	A notarized "Release of Liens"	_____	_____
2.	Proof of payment of prevailing wage rate	_____	_____
3.	Notarized copies of a daily log.	_____	_____
4.	Compilation in chronological order of all air monitoring records pertaining to this project.	_____	_____
5.	Compilation of all completed and signed Waste Shipment Record forms.	_____	_____
6.	Copies of notifications to applicable agencies.	_____	_____
7.	Paid invoice verifications for sub-contractor (for Time and Material job), service contract agreement, insurance certificates, copies of the workers licenses, and other required submittals.	_____	_____

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SECTION 03 0100
MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES (See Structural drawings for additional specifications and procedures)

A. Cleaning of existing concrete surfaces.

B. Repair of exposed structural, shrinkage, and settlement cracks.

C. Resurfacing of concrete surfaces having spalled areas and other damage.

D. Repair of deteriorated concrete.

E. Repair of internal concrete reinforcement.

F. Scope of Work: As indicated on structural drawings.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.3 PRICE AND PAYMENT PROCEDURES

A. Repair Surface: By the square foot (meter). Includes surface preparation, repair, finishing.

B. Preparation for Resurfacing: By the square yard (meter). Includes surface preparation, cleaning.

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 A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

E. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

F. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.

G. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

H. 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: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Manufacturer's Qualification Statement.

D. Installer's Qualification Statement.

E. Project Record Documents: Accurately record actual locations of structural reinforcement repairs and type of repair.

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 and with minimum of 3 years of documented experience.

1.7 MOCK-UP(S)

A. Test each type of maintenance procedure required on each type of existing construction, to determine the most appropriate procedures to use and as a record of expected results.

B. Horizontal Surface Repair: Total of 10 foot (3 m) square area, demonstrating each type of repair.

C. Vertical Surface Repair: Total of 10 foot (3 m) square area, demonstrating each type of repair.

D. Locate mock-up(s) where directed.

E. Re-work mock-up(s) until satisfactory to Architect and structural engineer.

F. Satisfactory mock-up(s) may remain as part of the work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

A. Degreaser:
   1. Manufacturers:
      a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com/#sle.
      b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; CITREX: www.lmcc.com/#sle.
      c. Nox-Crete, Inc; Bio-Clean Plus: www.nox-crete.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Detergent: Non-ionic detergent.

C. Strippers and Cleaners for Removal of Existing Coatings:
   1. Manufacturers:
      a. Nox-Crete, Inc; Deco-Strip Series: www.nox-crete.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.2 REPAIR MATERIALS

A. Troweled on concrete repair material (Top surfaces)
   1. Sikaquick 1000, Sika Corp.

B. Troweled on concrete repair material (Vertical and bottom surfaces)
   1. Sikarepair SHB, Sika Corp.

C. Flowable poured concrete repair material
   1. Sikacrete 211SCC Plus polymer modified concrete mix,Sika Corp.

D. Bonding Agent
   1. Sika Armatec 110 Epocem bonding agent, Sika Corp.

E. Grout
   1. Sikagrout 212 Non-shrink cementitious grout, Sika Corp.

F. Joint Sealant
   1. Sikaflex 1-A Elastomeric sealant / adhesive, Sika Corp.

G. Concrete Primer
   1. Sikafloor 1610, Sika Corp.

H. Traffic Bearing Membrane
   1. Sikalastic 720/745 Waterproofing Traffic System, Sika Corp.

Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Prepare concrete surfaces to be repaired according to ICRI 310.2R, and " General Repair Procedures" as specified on structural drawings..

3.3 CLEANING EXISTING CONCRETE

A. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
   1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
   2. Clean out cracks and voids using same methods.

B. The following are acceptable cleaning methods, in order from gentlest to less gentle:
   1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
   2. Increasing the water washing pressure to maximum of 400 psi.
   3. Adding detergent to washing water; with final water rinse to remove residual detergent.
   4. Steam-generated low-pressure hot-water washing.

3.4 CONCRETE STRUCTURAL MEMBER REPAIR

A. See drawings for specific areas to be repaired.

B. Follow repair product manufacturer's written installation instructions.

C. Feather edges of repairs flush to sound surface and trowel surface to match surrounding area.

3.5 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 4000, will perform field inspection and testing.

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. Floors and slabs on grade.

C. Concrete footings.

D. Concrete reinforcement.

E. Fiber reinforcement

F. Joint devices associated with concrete work.

G. Concrete curing.

H. Fence posts.

I. Concrete toppings.

J. Patching.

K. Finishes.

L. Mix design.

M. Vapor Retarder.

N. Concrete materials.

O. Placement procedure.

P. 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.

1.4 Reference Standards

A. ACI 301 - Specifications for Concrete Construction; 2020.

B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

C. ACI 305R - Guide to Hot Weather Concreting; 2020.

D. ACI 308R - Guide to External Curing of Concrete; 2016.

E. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

F. ACI 347R - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

G. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

I. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

J. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

K. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

L. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.

N. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

O. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

Q. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

R. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

S. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.

T. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

U. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

V. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).

W. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.

X. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2021.

Y. 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; 2018a.

Z. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

AA. COE CRD-C 513 - Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops; 1974.

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 PE seal and signature.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
   3. 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. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used; use LEED New Product Content Form.

I. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Brewster Central School District's name and registered with manufacturer.

K. Product Data: For each type of product indicated.

L. 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.

M. 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.

N. Qualification Data: For installer, testing agency, concrete supplier, and lab responsible for design mixes.
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O. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

P. 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 3.10.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 reduction 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 Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the 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.
   3. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to 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

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): Galvanized, plain type, ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. Mesh Size: 4x4.
   3. Wire Gage: w4.0 x4.0

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 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.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C 33.
   1. Acquire aggregates for entire project from same source.

C. Lightweight Aggregate: ASTM C330/C330M.
   1. 1.Nominal Maximum Aggregate Size:3/4 inch.

D. Fly Ash: ASTM C618, Class C or F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

G. Water: Clean and not detrimental to concrete.

H. Structural Fiber Reinforcement: ASTM C1116/C1116M.
   1. Fiber Type: Alkali-resistant synthetic.

2. Fiber Length: 0.25 inch (6 mm), nominal.
3. Manufacturers:
   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.

2.5 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Installation: Comply with ASTM E1643.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   3. Manufacturers:
      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. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
   a. Maximum Height Change: Plus 4 percent.
   b. Minimum Height Change: Plus 1 percent.

E. 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. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
1. Manufacturers:
   a. Kaufman Products Inc; SureBond: www.kaufmanproducts.net/#sle.
   b. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
   c. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com/#sle.
   d. Substitutions: 01 6000 - Product Requirements.

B. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
2. Manufacturers:
   a. Adhesives Technology Corporation; _____: www.atcepoxy.com/#sle.
   b. Dayton Superior Corporation; _____: www.daytonsuperior.com/#sle.
   c. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

C. 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.

D. Waterstops: Rubber, complying with COE CRD-C 513.
1. Configuration: As indicated on drawings.
2. Size: As indicated on drawings.

E. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
1. Size: As indicated on drawings.

F. 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. Manufacturers:

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.

G. 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..

2.7 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
1. Manufacturers:
a. Dayton Superior Corporation; _____: www.daytonsuperior.com/#sle.
b. Kaufman Products Inc; VaporAid: www.kaufmanproducts.net/#sle.
c. Substitutions: 01 6000 - Product Requirements.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
1. Product dissipates within 4 to 6 weeks.
2. Manufacturers:
a. Dayton Superior Corporation; Clear Cure VOC J7WB: www.daytonsuperior.com/#sle.
b. SpecChem, LLC; SpecRez: www.specchemllc.com/#sle.
c. W. R. Meadows, Inc; 1100-Clear: www.wrmeadows.com/#sle.

C. Curing Agent, Water Replacement Type: Clear, water based, liquid water cure replacement agent complying with ASTM C309 standards for water retention, and with ACI 302.1R.
1. Manufacturers:
a. Sinak Corporation; The CURE™WCE: www.sinak.com/#sle.

D. Moisture-Retaining Sheet: ASTM C171.
1. Polyethylene film, clear, minimum nominal thickness of 0.0040 inch (0.10 mm).

E. 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. 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. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.

B. Proportioning Normal and Structural Lightweight Concrete: Comply with ACI 211.2 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.
2. Cement Binder: ASTM C 150, portland cement.
3. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

C. 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.

D. Identify sources of all products used in design mixes.

E. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

F. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard (0.89 kg per cubic meter), or as recommended by manufacturer for specific project conditions. Slabs on grade only.

G. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch (27.6 MPa).
2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
5. Water-Cement Ratio: Maximum 0.45 .
6. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
7. Maximum Slump: 4 inches (100 mm).
8. Maximum Aggregate Size: 3/4 inch (19 mm).

2.10 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

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. 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.

F. 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.

G. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. 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 WATERSTOPS

A. Flexible Waterstops: Install in construction joints, all joints between foundation walls and footing or slab and as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

3.5 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, waterstops, and formed construction joint devices will not be disturbed during concrete placement.

F. 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.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.6 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, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.

3.7 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for conformance to 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 7 days.
2. High early strength concrete: Not less than 4 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.

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 conforming to 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 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

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

1.2 SECTION INCLUDES

A. Dust control.

B. Removal and rebuilding of exterior masonry units where indicated on drawings.

C. Repointing mortar joints where indicated.

D. Prepare and reseal masonry coping cross joints, parapet ledge cross joints and facade control joints.

E. Cast stone coping units.

F. Joint Fillers. Accessories.

G. Water Repellent. .

1.3 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls.

B. Section 04720 - Cast Stone

C. Section 04 2000 - Unit Masonry: Brick masonry units.

D. Section 05 5000 - Metal Fabrications. .

E. Section 07 9005 - Joint Sealers.

F. Section 09 9000 - Painting and Coating.

1.4 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

C. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on all material, including recommended installation procedures.

1.6 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.

B. Qualification: The sub-contractor with a minimum of five years experience, experienced masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

1. The Installer shall directly employ the personnel performing the work of this section

C. All masonry cleaners and coatings shall be approved by the brick manufacturer.

1.7 MOCK-UP

A. For repointing - provide 2 foot square mockups to show how the joints will be cut, and 2 foot square mockups to show new pointing
   1. Joint repointing shall be performed within 10 days of the award of contract in order to permit maximum drying time for mortar.

B. How flashings will be built into the masonry.

C. Clean a 10 ft (3 m) by 10 ft (3 m) panel of wall to determine extent of cleaning.
   1. Repeat, using different cleaning methods for up to three different panels.

D. Locate where directed.

E. Acceptable panel and procedures employed will become the standard for work of this section.

F. Mock-up may remain as part of the Work.

G. Allow samples to cure at least three days (or longer, if possible) before obtaining Owner's approval for color match. Mortar colors will continue to lighten as they cure and are exposed to the weather, so samples should be installed as far in advance as possible. Samples should be viewed from a minimum distance of 12 feet.

H. Water repellant coating.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened containers and packaging, bearing labels which identify the type and names of the products and Manufacturers. Unload and handle to prevent chipping and breakage.

1.9 FIELD CONDITIONS

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.

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.

C. Erect temporary covers over pedestrian walkways and at building entrances and exits which will remain active as the work progresses.

D. Prevent mortar from staining the face of surrounding masonry and other building surfaces, immediately remove any which falls or spills. Protect sills, ledges and projections from mortar droppings.

E. Coordinate masonry removal and restoration with the installation of new metal and membrane flashings

1.10 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 two year period beginning upon Final Completion:
   1. Defective work includes but is not limited to the following types of failure: leakage, 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:

B. The Contractor's Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.

C. 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 MANUFACTURERS

A. Restoration and Cleaning Chemicals:
   1. PROSOCO: www.prosoco.com/#sle.

B. Water Repellants:.
   1. Professional Products of Kansas, Inc. 800 676 7346
      a. PWS-15 (super strength)
      b. RTV silicone rubber, 15% solids

C. Substitutions: See Section 01 6000 - Product Requirements.

2.2 CLEANING MATERIALS

A. Cleaning Agent:ProSoCo; Sure Klean Light-Duty Restoration Cleaner Cathedral Stone.Syra G. by Cathedral Stone® Products, Inc
   1. Application: General Cleaning of existing masonry units.

B. Cleaning Agent:ProSoCo; Vana Trol, sensitive brick and stone. www.prosoco.com
   1. Application: General Cleaning of new masonry units.

C. Cleaning Agent:ProSoCo Sure Klean
   1. Application: General Cleaning Limestone, precast and masonry
   2. Afterwash:ProSoCo Sure Klean 766 Limestone & Masonry Afterwash

2.3 MATERIALS

A. Repointing and Repair Mortar: complying with the following:
   1. Submit sample of existing mortar to manufacturer for analysis, color and mixing.
   2. Type S Mortar.
      a. Portland Cement: ASTM C150
      b. Compressive strength:1400-1700 psi
      c. Tensile bending strength:449 psi
      d. Absorption (%):13
      e. Aggregate:ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
      f. Lime: ASTM 207 Type S or SA
      g. Color: Match existing color and texture.

2.4 MASONRY ANCHORS

A. All reinforcement and anchors located in exterior walls shall be stainless steel.

B. Anchors: Type and size indicated, or if not indicated, to match existing in size and type. Fabricate anchors and dowels from Type 302 or Type 304 stainless steel.

C. Metal Mesh Wall Tie: Stainless steel 1/2" square, 16 gauge 2" wide.
   1. Product: MWT by Hohmann & Barnard.

2.5 ACCESSORIES

A. Sealant Refer to Section 07 9005 - Joint Sealers.

B. Masonry Coating: Refer to Section 09 9723 - Concrete and Masonry Coatings

C. Joint Filler: Closed cell neoprene; 3/8" inch (____ mm) wide x 3" wide x by maximum lengths available. Provide tear strip to permit sealant joint.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc; Product MS: www.h-b.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.6 EMBEDDED FLASHING MATERIALS

A. Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
   1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 40 mils.
   2. Available Products:
      a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
      b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
      c. Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
      d. Hohmann & Barnard, Inc.; Textroflash.

2.7 MORTAR MIXES

A. Comply with ASTM C 270, Proportion Specification
   1. Setting mortar, use Type S.
   2. Pointing mortar Type S.

B. Mortar Proportions: Mix mortar materials in the following proportions
   1. Pointing Mortar for Concrete Block: Comply with manufacturer's requirements and ASTM C 270.
   2. Replacement Mortar: Comply with ASTM C 270, Proportion Specification, Type S.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

3.2 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Separate areas to be protected from restoration areas using means adequate to prevent damage.

C. Cover existing landscaping with tarpaulins or similar covers.

D. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

E. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.3 BLOCK REMOVAL AND REPLACEMENT

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. The Contractor is responsible for performing Work in a safe manner. Provide temporary shoring or other supports as required to prevent displacement of existing masonry that is to remain. Perform the removal Work with such care as may be required to prevent failure of the masonry or damage to adjoining masonry that is to remain

C. Cut away loose or unsound adjoining masonry and mortar as directed. Do not use impact type tools, use only rotary type grinders.

D. Do not damage masonry units.

E. When cutting is complete, remove dust and loose material brushing and with water jet.

F. Build in new units following procedures for new work. .

G. Ensure that anchors, ties, reinforcing, and flashings are correctly located and built in.

H. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings. Use a motor driven diamond blade saw to cut bricks with clean, sharp, unchipped edges.

I. Install through wall flashings properly connected to the existing wall as indicated. before installing the new bricks

J. Install metal wall tie mesh in each joint.

K. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brick work

3.4 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Repointing of existing joint where joint reinforcing is exposed, shall be as indicated and detailed on drawings.

C. Cut out loose or disintegrated mortar in joints to minimum 3/4" inch (____ mm) depth or until sound unweathered mortar is reached. Use power chisels die grinder, circular grinder or other power equipment approved by the Architect.

1. Test mock-up shall be performed in area directed by the Architect. Contractor shall not proceed until mock-up and methods are approved.
2. Use power tools only after test cuts determine no damage to masonry units will result.
3. Provide vacuum attachment for all grinding/cutting equipment for dust control purposes.

D. Do not damage masonry units. Do not spall the edges of adjoining masonry or widen the joints. Replace any masonry which is damaged.

E. When cutting is complete, remove dust and loose material brushing and with water jet.

F. Pack tightly in maximum 1/2 inch (____ mm) layers. Form a smooth, compact concave joint to match existing.

G. Slightly recess pointing mortar from the faces of the masonry units where the units have rounded edges. Do not spread mortar on the edges or faces of the masonry. Do not featheredge the mortar.

H. Tool repointed joints to match the appearance of adjoining joints when the mortar is thumbprint hard. Remove excess mortar from the edges of the joints with a soft bristle brush

I. Moist cure for 72 hours.

J. Clean repointed area minimum 24" each side of repointed joints.

1. Immediately after the mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter using stiff nylon or bristle brushes and clean water, spray applied at low pressure.
2. Do not use metal scrapers or brushes. Do not use acid or alkali cleaning agents

K. Remove efflorescence by dry brushing followed by wet brushing.

3.5 COPING STONES REPLACEMENT

A. Install new through wall to flashings .

B. Install two, 1/2 inch diameter, 6 inch long stainless steel dowels, per coping stone, set in two-part epoxy, 4 inches deep into the parapet wall. Reset the existing coping stones into a full mortar bed joint, over the through wall flashing and dowels. Install the coping units, straight, level, plumb, square, true, and in alignment.

C. Form soft, sealant filled joints between all coping sections

3.6 SETTING CAST STONE IN MORTAR

A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
3. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
4. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
5. Drench units with clear water just before setting.

B. Set units in full bed of mortar with full head joints, unless otherwise indicated. Build anchors and ties into mortar joints as units are set.
1. Set dowels with epoxy grout.
2. Fill collar joint solid as units are set.
3. Build concealed flashing into mortar joints as units are set.
4. Install weeps as manufacturer's instructions.
5. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.

C. Rake out joints for pointing with mortar to depths of not less than ¾ inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
1. For coping joints provide backer rod and sealant for all joints as indicated..

3.7 CLEANING EXISTING MASONRY

A. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar

B. Test surface for cleaning effectiveness.

C. Masonry Washing: Apply 400-1000 psi pressure, water flow rate of 6-8 gallons per minute, to masonry surfaces , maintaining uniform depth and surface texture throughout. Use 15-45 degree fan spray. If required heat water to 150-180 degree.

D. Application: Work from bottom to top, pre wetting surfaces
1. Let dwell 5 to 15 minutes. Do not let let cleaner dry on the surface.
2. Work from bottom to top and rinse
3. Repeat steps as required.

3.8 PENETRATING WATER REPELLENTS

A. Preparation: Substrate must be clean, dry and free of foreign contaminates.
1. Repair materials must be fully cured prior to applying masonry sealer.
2. Protect all surface not compatible with sealer.
3. Protect windows when required by the manufacture.
4. Does not start work until surfaces to be coated are in proper condition to produce finished surfaces of uniform, satisfactory appearance.
5. Mildew, algae and fungus should be removed using material as recommended by the manufacturer.
6. Remove dust and loose particulate matter from surfaces to receive coatings immediately prior to coating application.
7. Cracks and spalls must be repaired and cured prior to application.
8. To ensure even penetration, make sure any masonry repairs have been made with repair materials that are compatible to the substrate.

9. Remove any previous or existing coatings before application of sealer.
10. Substrate must be completely dry before coating. Do not work when precipitation is expected within 24 hours of installation.

B. Mock-ups: Prepare sample for each type of substrate to be treated.

C. Application:
1. Follow manufacturers' instructions.
2. Clearly mark or identify areas that have been treated at the end of each shift.
a. Apply sealer in a systematic pattern to ensure complete.
b. Apply wet on wet
3. Spray application shall be from bottom up, creating 4-8" rundown below spray contact point
a. Let dwell 5 to 10 minutes for penetration and re saturate.
4. Brush application shall be from bottom up, saturating uniformly.
a. Let dwell 5 to 10 minutes for penetration and re saturate. Brush out heavy runs and drips.

3.9 FIELD QUALITY CONTROL

A. Inspectors: Owner may engage qualified inspectors to perform inspections and prepare test reports. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Notify Architect, Construction Manager, and Inspectors in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.10 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

D. As scaffolding is removed, patch anchor holes used to attach scaffolding.

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. Special shapes (Radial Brick)
D. Concrete Brick.
E. Clay Facing Brick.
F. Mortar and Grout.
G. Reinforcement and Anchorage.
H. Cavity Wall Insulation
I. Flashings.
J. Lintels.
K. Masonry Accessories.

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 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. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
   1. Grouting and Reinforcing: All masonry and grouting and reinforcing work shall be performed by masonry craftworkers who have successfully completed the International Masonry Institute (1-800-IMI-0988) training course for Grouting and Reinforced Masonry Construction, or equal.
   2. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
   3. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.
   4. 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
   5. 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.
   6. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five (5) years of documented experience.
   7. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
   8. 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 typical 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, cast stone 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 additional 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 4534 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. 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. **Brick :** “MUDBOX WATEX, OWASCO (M) Type 2 Modular , Watsontown Brick Company, P. O. Box 68 Watsontown PA 17777; Distributed by CASA Building Materials, John Blair, 646 702 8410
2. 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. See drawing details for specific special shapes.
   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 .
   1. Color: Casa Leather # leather N
   2. Manufacturers:
      a. SPEC MIX LLC

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: 0.1483 inch (9 gauge).
   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 9 ga Width dependent on application

D. Adjustable Multiple Wythe Masonry Joint Reinforcement: Ladder type; Steel wire, hot dip galvanized after fabrication to ASTM A153/153M, Class B;Extra heavy duty 3/16" side rods x 9ga. 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. .
   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 ML Ladder, Adjustable Eye-Wire”.

E. Adjustable Anchors For Cavity wall with Masonry Backup.
   1. Adjustable Joint Reinforcement: Ladder type with adjustable ties or tabs spaced at 16 in (406 mm) on center and fabricated with moisture drip; stainless steel wire conforming to ASTM A 580/A 580M Type 304; 0.1875 inch (4.8 mm) side rods with 0.1875 inch (4.8 mm) cross rods and adjustable components of 0.1875 inch (4.8 mm) wire; width of components as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage from each masonry face. Flush weld all keys. Provide stainless steel for exterior walls.
      a. Vertical adjustment: Not less than 2 inches (50 mm).
      b. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.
         a) Hohmann & Barnard. #270 ML Ladder. adjustable eye wire with hot-dip galvanized steel 1/4" diameter mighty lock hook.

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.
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 1/4-inch-diameter, wire anchor section for welding to steel and one piece, triangular wire-ties compatible with anchor.
   a. #359 Weld-On Tie" and "#302W Column Web Tie", by Hohmann & Barnard. Use #359 FP Weld-On Ties if columns are fireproofed.
   b. Use Notched Column anchor, Heckman 189, L type column anchor at steel columns adjacent to Firewalls. 1/8" Zinc alloy 710 material.

H. Rigid Anchors
1. Provide straps of form and length indicated in drawings, fabricated from galvanized, heavy thickness hot dipped galvanized sheet, 1 1/2 inches wide by 1/4 inch thick with 2-inch bends.
2. Where rigid anchors are used to bond intersecting walls, strap shall be 24 inches long, plus 2-inch bends at each end.
   a. #344 - Rigid partition anchor, Hohmann and Barnard

I. Wall Ties: Corrugated formed sheet metal, 7/8 inch (22 mm) wide by 0.05 inch (1.22 mm) thick, hot dip galvanized 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. CWT, Hohmann and Barnard.

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
1. #345, Hohmann & Barnard

K. Dovetail Anchor: 14 gauge, 1" wide, hot dip galvanized steel designed for fastening to concrete / dovetail slot backup.
   1. # 315 Dovetail Anchor, hot dip galvanize, Hohmann & Barnard

L. Dovetail Slot:
   1. 16 ga. hot dip galvanized. # 305, H&B
   2. Temporarily fill or cover face of opening of slots to prevent intrusion of concrete or debris.

M. 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. Sill Stone anchor:
      a. #433 stone anchor, stainless steel. 3/16" thick . H&B.
   5. Cast Stone Anchors: Refer to Section 04-7200 Cast Stone Masonry for additional information.

N. 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. Flexible Flashing Use only where flashing is fully concealed in masonry.
   1. Asphalt free self adhering copper fabric flashing, 5 0z. copper. 3 inch flex flash drip edge.
   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. Termination Bars: 1/8' x 1", stainless steel with foam seal. Use at top of all flashing.
   5. Manufacturers:
      a. Hohmann and Barnard, Copper SA. flashing.
      b. H&B T2 termination bar.

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 2-inch, stainless steel drip edge. 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.
      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.

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. 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. Termination Bars: Stainless steel; compatible with membrane and adhesives.
13. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.
14. Weeps:
    a. Type: Molded polypropylene grilles, insect resistant.
    b. Manufacturer:
        a) QV - Quadro-vent; Hohmann & Barnard, Inc: www.h-b.com.
15. Cavity Vents:
    a. Type: Molded PVC grilles, insect resistant.
    b. Manufacturer:
        a) Hohmann & Barnard, Inc: www.h-b.com <http://www.h-b.com>.
            (a) Location in brick cavity
16. 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.
17. 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.
18. Mortar Collection System: High density polyethylene woven strands. 90% open mesh.
19. Provide at all flashing / lintel locations in cavity walls and as indicated on the drawings.
    a. Mortar Trap, Hohmann & Barnard, Inc
20. Epoxy Adhesive: Fiber Glast 1101.
    a. MSG Hohmann & Barnard, Inc.

2.9 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

2.10 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 brick mortar joints. Color as specified..

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: 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: Match existing.
      b. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
      c. Mortar Joints: Concave.

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. Do not use units with less than nominal 4-inch horizontal face dimensions.
   2. Avoid use of less-than-half-sized units at corners, jambs, and where possible at other locations.
   3. Where indicated in drawings, match coursing, bonding, color, and texture of new masonry with existing masonry.

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 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 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.

3.20 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.

3.21 FIELD QUALITY CONTROL

A. Refer to Section 01 4534 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.

3.22 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.

3.23 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).

3.24 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"

3.25 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, sills, and cornice bands.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

B. Section 07 6200 - Sheet metal flashings and trim

C. 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. Source Quality Control Test Reports.

G. 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 MOCK-UP

A. Mock-Up: Provide full size cast stone components for installation in mock-up of exterior wall. See mock up requirements as indicated in Section 04 4200.

B. See Section 01 4000 - Quality Requirements for additional requirements.
   1. Approved mock-up will become standard for appearance and workmanship.
   2. Mock-up may not remain as part of the completed work.
   3. Remove mock-up not incorporated into the work and dispose of debris.

1.9 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. Substitutions: See Section 01 6000 - Product Requirements.

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. 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
2. Spring Loaded Dowel: 3/8" x 3", stainless steel rod with 3'2": stainless steel spring.
a. #355 Heckmann Building Products.
3. Type 304 Stainless Steel Dowel: 3/8" x 3".
a. #155 Heckmann Building Products.
4. Stone and Masonry Anchor: Type 304 Stainless Steel, 1" x 16 ga. x length required.
a. #274 and #275V by Hohmann & Barnard.

5. Anchor Pin: Type 304 Stainless Steel, 8" x 1/2"diameter.
   a. #407 by Hohmann & Barnard.
6. Back-up Wall Anchor: Type 304 stainless steel.
   a. "Pos-I-Tie" with triangle wire tie by Heckman Building Industries.

K. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

L. Shelf Angles and Similar Structural Items: Type 304 stainless steel, of shapes and sizes as required for conditions.

M. Mortar: Portland cement-lime, as specified in Section 04 0511; do not use masonry cement.

N. 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.

O. Refer to Section 07 6200 - Sheet Metal Flashing and Trim for metal flashings.

P. Section 04 0511 - Mortar and Masonry Grout for mortar and epoxy grout.

Q. 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 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. Structural steel support members, suspension cables, sag rods, struts, and tie rods.

B. Architecturally exposed structural steel, columns, rolled steel trusses, and ties.

C. Base plates, shear stud connectors and expansion joint plates.

D. Grouting under base plates.

E. Anchor bolts, base and bearing plates.

F. Openings, reinforced and un-reinforced in structural steel.

G. Hung lintel assemblies including diagonal braces.

1.3 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

B. Section 01 7000 - Execution for survey requirements.

C. Section 05 3100 - Steel Decking: Support framing for small openings in deck.

D. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

E. Section 09 9123 - Interior Painting.

1.4 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2017.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts; 2004.

D. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."

E. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design.

F. AISC's "Specification for Allowable Stress Design of Single-Angle Members.

G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

I. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

J. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel; 2013 (Reapproved 2018).

K. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

L. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2019.

M. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

N. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2021a.

O. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2021a.

P. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

Q. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2020.

R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

S. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2018.

T. 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.

U. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2019.

V. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.

W. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2013.

X. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

Y. 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.

Z. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

AA. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

AB. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

AC. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.

AD. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

AE. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

AF. UL (FRD) - Fire Resistance Directory; Current Edition.

1.5 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.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   5. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   6. Include embedment drawings.
   7. Indicate type, size, and length of bolts. Identify Pretensioned and slip-critical high-strength bolted connections.
   8. For structural-steel connections indicated to comply with design loads, include structural analysis data prepared by the qualified professional engineer responsible for their preparation.
   9. Qualification Data: For Installer, fabricator and professional engineer.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

F. Submit non-shrink grout, primer, finish paint , and manual of high strength bolts.

G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.6 PERFORMANCE REQUIREMENTS

A. Comply with New York State Uniform Fire and Building Code Chaper 16 “Structural Design” -

B. Construction: Types 1, rigid frame; 2, simple framing.

C. Construction: Type FR, fully restrained.

D. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design," Part 4 and comply with connection details shown on structural drawings.
2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer, license to practice in the State of New York, to prepare structural analysis data for structural-steel connections, including splices where required.

1.7 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Structural steel members designated as architecturally-exposed structural steel (AESS) to also comply with Section 05 1213.

C. Fabricator: Company specializing in performing the work of this section with minimum 10 years of documented experience, and is a designated an AISC-Certified Plant

D. Erector: Company specializing in performing the work of this section with minimum 10 years of documented experience and is a designated an AISC-Certified Erector.

E. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in New York. Where steel splices are required due site conditions, design splices for 100% of beam capacity.

F. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the New York State 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.

1. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections

1.8 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Conform to UL (FRD) Assembly Design No. as indicated on drawings.

2.2 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. Pipe: ASTM A53/A53M, Grade B, Finish black.

I. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

J. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.

K. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563/A563M nuts and ASTM F436/F436M Type 1 washers.

L. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

M. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

N. Grout: Non-shrink, non-metallic aggregate type, complying with 1 and capable of developing a minimum compressive strength of 7,000 psi (48 MPa) at 28 days.

O. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

P. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Space shear stud connectors at 12 inches (300 mm) on center, unless otherwise noted on plans.

C. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

D. Fabricate connections for bolt, nut, and washer connectors.

E. Develop required camber for members.

F. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming

G. 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.
2. All exposed welds shall be Type 1

2.4 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP6/NACE No. 3, "Commercial Blast Cleaning" for all exposed steel.

B. SSPC-SP 3, "Power Tool Cleaning" for steel not exposed

C. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

D. 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

2.5 SOURCE QUALITY CONTROL

A. Provide shop testing and analysis of structural steel.
   1. Members to be Tested: welded, shop-welded shear connectors .
   2. Test Method: AWS D1.1.

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 2 percent of bolts at each connection.

C. Welded Connections: Visually inspect all shop-welded connections and test at least 10 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.

B. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

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 and shear studs 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. 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
   1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
      a. Leveling plates will not be permitted.
   2. Weld plate washers to top of base plate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
   4. 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 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. All tests to be done under supervision of NY State Licensed P.E.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections

B. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
   1. All test shall be performed under the supervision of a NY State licensed Engineer.

C. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts", testing at least 25 percent of bolts at any given connection. If any bolt in a connection falls short of torque specified by bolt manufacturer, test all remaining bolts at connection.. Provide follow up reports.

D. Welded Connections: Visually inspect all field-welded connections and test at least 20 percent of welds using one of the following:
   1. Ultrasonic testing performed in accordance with ASTM E164.
   2. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   3. Magnetic particle inspection performed in accordance with ASTM E709.

E. 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 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. Supplementary framing for openings from 6 - 18 inches (150- 450 mm) and at columns.

C. 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) and shear stud connectors.

C. Section 09 9113 - Exterior Painting.

D. Section 09 9123 - Interior Painting.

1.4 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.

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 B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

F. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

G. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

H. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; 2016.

I. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; 2016.

J. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

K. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

L. UL (FRD) - Fire Resistance Directory; Current Edition.

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. Submit manufacturer's installation instructions.

F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

G. 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. G.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. Wheeling Corrugating Co: www.wheelingcorrugating.com.
   4. 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.
   1. Calculate to structural working stress design and structural properties specified.
   2. Maximum Vertical Deflection of Floor Deck: 1/360 of span.
   3. Maximum Vertical Deflection of Roof Deck: 1/360 of span.
   4. Maximum Lateral Deflection of Diaphragms: 1/500 of the height of the wall.

B. Roof Deck: Non-composite type, fluted steel sheet:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
   2. Deck Profile: Type B
   3. Profile Depth: 1 1/2"
   4. Design Uncoated-Steel Thickness: As indicated.
   5. Span Condition: Three span continuous wherever possible, unless otherwise shown

6. Structural Properties:
   a. For required size and gauge of deck, see structural drawings.
7. Minimum Base Metal Thickness:: 18 ga.
8. Nominal Height: 1-1/2 inch (38 mm).
9. Profile: Fluted; SDI NR.
10. Formed Sheet Width: 36 inch (900 mm).
11. Side Joints: Lapped, welded or screwed.
12. End Joints: Lapped, welded.

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.
   2. Material: Steel; ASTM A510/A510M.
      a. Hardness: Rockwell C 54.5, minimum.
      b. Tensile Strength: 285 kips per square inch (1965 MPa), minimum.
      c. Shear Strength: 175 kips per square inch (1205 MPa), minimum.
      d. Washers:
         a) Exposed Roof Deck Applications: 0.591 inch (15 mm) diameter, minimum.
      e. Corrosion Resistance:
   3. Products:
      a. Hilti.
      b. Substitutions: Section 01 2500 Substitutio Procedures.

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.
   4. Products:
      a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series: www.ITWBuildex.com.
      b. Substitutions: Section 01 2500 Substitution Procedures.

F. Weld Washers: Mild steel, uncoated, 3/4 inch (19 mm) outside diameter, 1/8 inch (3 mm) thick.

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, complying with VOC limitations of authorities having jurisdiction.

I. Flute Closures: Closed cell synthetic rubber, 1 inch (25 mm) thick; profiled to fit tight to the deck.

J. 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

K. Column Closures,, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated

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.

N. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

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.

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. 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.

M. 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.

N. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

O. Close openings above walls and partitions perpendicular to deck flutes with double row of foam cell closures.

P. 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. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. 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.

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. Formed steel stud exterior wall and interior wall framing.

B. Polyethylene vapor barrier.

1.3 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

B. Section 04 2000 - Unit Masonry for masonry anchors, cavity insulation., and embeded flashings.

C. Section 05 1200 - Structural Steel Framing .

D. Section 05 3100 - Steel Decking.

E. Section 05 5000 - Metal Fabrications for masonry shelf angles and connections.

F. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

G. Section 07 2100 - Thermal Insulation: Insulation within framing members.

H. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

I. Section 07 6200 - Sheet Metal Flashing and Trim: Head and sill flashings.

J. Section 07 9200 - Joint Sealers .

K. Section 09 2116 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

L. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.4 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 Amendment (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; 2020.

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. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

N. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.5 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.

1.6 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: 20 psf.
   2. Live Loads: 50 psf.
   3. Roof Loads: 40psf.
   4. Snow Loads: 35 psf.

1.7 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 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 .

1.8 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.

1.9 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.

1.10 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. Marino; -: www.marinoware.com.
2. The Steel Network, Inc; -: www.SteelNetwork.com.

B. Framing Connectors and Accessories:
1. Same manufacturer as metal framing.
2. Substitutions: Section 01 2500 Substitution Procedures.

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. Shop fabricate framing system to the greatest extent possible.

D. 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. Gage and Depth: As indicated on the drawings and as required to meet specified performanceminimum levels..
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.
1. Products:
a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series: www.ITWBuildex.com.

B. Anchorage Devices: Powder actuated.

C. Welding: Comply with AWS D1.1/D1.1M.

2.5 WALL SHEATHING

A. Gypsum Board Wall Sheathing: See Section 09 2116.

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.
   2. Tape: Bright aluminum self-adhering type, mesh reinforced, 2" wide.

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.

F. Water-Resistive Barrier: See Section 07 2500.

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 Installation - General

A. Install structural members and connections in compliance with ASTM C1007.

3.3 PREPARATION

A. Grout bearing surfaces uniform and level to ensure full contact of track webs on supporting concrete or masonry construction

3.4 INSTALLATION OF STUDS

A. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations

B. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

C. 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.

D. 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 welding 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

E. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

F. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members

G. Install temporary bracing and supports to secure framing and support loads

H. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

I. Install intermediate studs above and below openings to align with wall stud spacing.

J. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

K. Attach cross studs to studs for attachment of fixtures anchored to walls.

L. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

M. 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.

N. Provide cross bracing or horizontal bracing at story heights of greater than 14'-0".

O. 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

P. Touch-up field welds and damaged galvanized surfaces with primer.

3.5 INSTALLATION OF WALL SHEATHING

A. Refer to Section 10 00021 - 10 00021.

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 (1.56 mm).

B. Maximum Variation of any Member from Plane: 1/16 inch (1.56 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. Steel framing and supports for applications where framing and supports are not specified in other Sections.

B. Loose lintel where required, shown on drawings or for work under this section.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

B. Section 05 1200 - Structural Steel Framing: Structural steel column anchor bolts.

1.4 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

I. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019.

J. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

K. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

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 D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

O. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

Q. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.5 PERFORMANCE REQUIREMENTS

A. 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:

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. 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. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

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.

2.2 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 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.

2.4 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

2.5 FABRICATED ITEMS

A. Lintels: As detailed. Finish: Prime paint interior lintels; galvanized for exterior lintels. Refer to Section 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

B. Recessed Mat Frames : As detailed. See spec section 12-4813. .

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.7 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.

2.8 FINISHES - STEEL Refer to Section 09900 Paints and Coatings.

A. Prime paint steel items.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. 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.

E. 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.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.9 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 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. Wall mounted handrails.

B. Railings and guardrails.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

1.4 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (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. 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.

C. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

D. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.2 Structural Welding Code – Aluminum.

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.

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. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Samples: Submit two, 12 inch (- mm) long samples of handrail. Submit two samples of elbow, wall bracket, and end stop.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

1.8 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 company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.1 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and 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: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.

H. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Posts: Tube rails unless otherwise noted.1-1/2 inches (38 mm) diameter, round.
   2. Intermediate Rails and Wall Rails: 1-1/4 inches (1-1/2 mm) diameter, round.
   3. Posts: 1-1/2 inches (38 mm) diameter, round.
   4. Balusters: Per drawing details.
   5. Guard Rail: Per drawing details

I. Guards:
   1. Top Rails and Posts: Tube rails unless otherwise indicated.
      a. 1-1/2" x 1-1/2"
   2. Railings: Outside diameter: 1 1/2 inch (- mm), minimum, to 1-1/2 inches (38 mm), maximum unless otherwise indicated.
   3. Infill at Picket Railings: Vertical pickets.
      a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
      b. Material: Solid steel bar.
      c. Shape: Square.
      d. Size: 1/2 inch (____ mm) square.
      e. Top Mounting: Welded to underside of top rail.
      f. Bottom Mounting: As indicated on drawings.
   4. End and Intermediate Posts: Same material and size as top rails.
      a. Horizontal Spacing: As indicated on drawings.

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. .
   2. 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.

L. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
   1. Ease exposed edges to a small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

2.2 STAINLESS STEEL

A. Handrails Pipe: ASTM A 312/A 312M, Grade TP 316L.

B. Castings: ASTM A 743/A 743M, Grade CF 8M or CF 3M.

C. Plate and Sheet: ASTM A 666, Type 316L.

2.3 HANDRAILS AND GUARDS (All components shall be of stainless steel.)

A. Guards:
   1. Top Rails and Posts: Tube rails unless otherwise indicated.
      a. 1-1/2" x 1-1/2"

2. Railings: Outside diameter: 1 1/2 inch (- mm), minimum, to 1-1/2 inches (38 mm), maximum unless otherwise indicated.
3. Infill at Picket Railings: Vertical pickets.
   a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
   b. Material: Solid steel bar.
   c. Shape: Square.
   d. Size: 1/2 inch (____ mm) square.
   e. Top Mounting: Welded to underside of top rail.
   f. Bottom Mounting: As indicated on drawings.
4. End and Intermediate Posts: Same material and size as top rails.
   a. Horizontal Spacing: As indicated on drawings.
   b. Mounting: Welded to top surface of stringer.

2.4 BRACKETS, CONECTORS AND MISCELLANEOUS ITEMS

A. Wall Brackets: Provide wall brackets as follows:
   1. Universal Weld Bracket as manufactured by Wagner Company.
      a. Model 1980SS for stainless steel railings.

B. Base Flanges: Wagner heavy flush base flanges.

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. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
   1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

C. 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.

D. 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. Close exposed ends of railing members with prefabricated end fittings.

H. 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.

I. 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.

J. Fasteners: Provide hex set screws for all fasteners.

K. 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..

L. 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.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
   2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
   1. Exterior Railings (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." and Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

C. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
   1. Paint . See Section 09 9113

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. 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.

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. Concealed wood blocking, nailers, and supports at windows.

B. Miscellaneous wood nailers, furring, and grounds.

1.3 RELATED REQUIREMENTS

A. Section 06 1010 - Roof Related Rough Carpentry.

B. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

C. Section 08 5113 - Aluminum Windows

D. Section 12 2940 - Roller Shades.

E. Section 12 3200 - Plastic Laminated Casework.

1.4 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

B. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

C. ICC (IBC) - International Building Code; 2018.

D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

E. PS 20 - American Softwood Lumber Standard; 2015.

F. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Pre-work site and building inspection report with photos, to document conditions before work starts.

C. Product Data: Provide technical data on lumber, plywood, fasteners, and application instructions .

D. 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.

E. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

F. Material Safety Data Sheets

G. Technical submittals shall be prepared and made by the firm that will perform the actual work.

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.

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.

C. Do not overload the structure when storing material on the roof.

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.

B. Lumber fabricated from old growth timber is not permitted.

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. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, 3/4" thick; flame spread index of 25 or less; smoke developed index 450 or less, when tested in accordance with ASTM E84.

B. 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: Stainless steel for high humidity, exterior and all preservative-treated wood locations, hot-dipped galvanized steel per ASTM A153/A153M for interior use where wood is not pressure treated..
   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.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.2 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In 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-mounted door stops.
   3. Visual display boards
   4. Windows.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (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.

3.4 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.6 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, shims, plywood, soffits, and fascia boards.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry.

B. Section 07 6200 - Sheet Metal Flashing and Trim

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; 2017.

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 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 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. Do not submit trade association literature.
4. 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.
5. 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, creases, wrinkles 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. The Contractor's Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.

C. 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.

D. Refer to Section 01 7800 - Closeout Submittalsfor 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 Type CDX underlayment plywood.
   3. Beveled Siding: Utility grade cedar, redwood, or synthetic siding, 1/2 inch by 6 inches and 3/4 inch by 10 inches wide, tapered to 1/8 inch thick.
   4. Fascia Boards: 5/4 inch clear white pine where painted. Douglas Fir dimension lumber where covered with metal or other materials

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. 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. See below for specific locations.

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. Metal and Finish: Stainless steel for high humidity and all 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 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: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.

A. Comply with applicable regulations.

B. Do not burn scrap on project site.

C. Do not burn scraps that have been pressure treated.

D. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

END OF SECTION

SECTION 07-0150
REHABILITATION OF MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof re-coating preparation.

2. Application of fluid-applied roof membrane and flashings over existing granule-surfaced modified bituminous membrane roofing.

B. Related Information:

1. Division 01 Section "Summary" for use of the premises and phasing requirements, and for restrictions on use of the premises due to Owner or tenant occupancy.

2. Division 07 Section "Maintenance Cleaning of Membrane Roofing" for reclaimed water cleaning system for preparation of existing roof substrate.

C. Unit Prices: Refer to Division 01 Section "Unit Prices" for description of Work in this Section affected by unit prices.

1.2 ROOFING CONFERENCES

A. Roofing Rehabilitation Preinstallation Conference: Conduct conference at Project site to review methods and procedures related to roofing system.

1. Meet with Owner; Architect; roofing re-coating materials manufacturer's representative; roofing re-coating Installer including project manager and foreman; and installers whose work interfaces with or affects re-coating including installers of roof accessories and roof-mounted equipment requiring removal and replacement as part of the Work.

2. Review methods and procedures related to re-coating preparation, including membrane roofing system manufacturer's written instructions.

3. Procedures for salvaging and recycling of demolition and construction waste

4. Review temporary protection requirements for existing roofing system that is to remain, during and after installation.

5. Review roof drainage during each stage of re-coating and review roof drain plugging and plug removal procedures.

6. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

7. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect re-coating.

8. Review HVAC shutdown and sealing of air intakes.

9. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.

10. Review procedures for asbestos removal or unexpected discovery of asbestos-containing materials.

11. Review governing regulations and requirements for insurance and certificates if applicable.

12. Review existing conditions that may require notification of Owner before proceeding.

1.3 MATERIALS OWNERSHIP

A. Demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

B. Roofing Coating Preparation: Existing roofing that is to remain and be prepared to accept restorative coating application.

C. Patching: Removal of a portion of existing membrane roofing system from deck or removal of selected components and accessories from existing membrane roofing system and replacement with compatible similar materials.

D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.

E. Existing to Remain: Existing items of construction that are not indicated to be removed.

F. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

G. Demolition Waste: Building and site improvement materials resulting from re-roofing preparation, demolition, or selective demolition operations.

H. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Roofing Inspector.

1. Letter written for this Project indicating manufacturer approval of Installer to apply specified products and provide specified warranty.

2. Provide separate letter for manufacturer’s technical inspector.

B. Contractor's Product Certificate: Submit certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

C. Manufacturer's Certificate:

1. Provide manufacturer's UL listing certificate for roofing system.

2. Provide letter stating that all materials to be used on the project are compatible with the polyurethane restoration system.

D. Proposed Protection Measures: Submit report, including Drawings, which indicates the measures proposed for protecting individuals and property, for environmental protection, and for dust control. Indicate proposed locations and construction of barriers.

E. Warranties: Unexecuted sample copies of special warranties.

F. Existing Conditions Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, which might be misconstrued as having been damaged by re-coating operations. Submit before Work begins.

G. Inspection Reports: Reports of Roofing Inspector. Include description of work performed, tests performed, defective work observed, and corrective actions required and carried out.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

B. Warranties: Executed copies of approved warranty forms.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of three years' experience installing products comparable to those specified, able to communicate verbally with Contractor, and employees, and the following:

1. Qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. Manufacturer Qualifications: Primary product manufacturer that is UL listed for roofing system identical to that specified for this Project with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

1. Approval of Other Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.

b. Samples of each component.

c. Sample submittal from similar project.

d. Project references: Minimum of five installations of specified products with Owner and Architect/Owner's Consultant contact information.

e. Sample warranty.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with rehabilitation work only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

1. Store all materials prior to application at temperatures recommended by manufacturer.

2. Apply coatings within range of ambient and substrate temperatures recommended by manufacturer.

3. Do not apply roofing in snow, rain, fog, or mist.

B. Protect building to be rehabilitated, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from rehabilitation operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

E. Owner will occupy portions of building immediately below re-coating area. Conduct re-coating so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1.10 WARRANTY

A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.

1. Form of Warranty: Manufacturer's standard warranty form.

2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.

3. Warranty Period: 30 years from date of completion.

B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.

1. Inspections to occur in following years: 2, 5, 10, 15, 20 and 25 following completion.

C. Installer Warranty: Installer's warranty signed by Installer, as follows.

1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.

2. Scope of Warranty: Work of this Section.

3. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc., (800) 562-2728, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products or comparable products of one of the following.

1. Tremco CPG Inc., Basis-of-Design.

2. Kemper.

3. Pacific Polymers.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Rehabilitated roofing shall withstand exposure to weather without failure or leaks due to defective manufacture or installation.

1. Accelerated Weathering: Roofing system shall withstand 5000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Exterior Fire-Test Exposure: Roofing system exterior fire-test exposure performance following application of rehabilitation coating shall not be less than that of the pre-rehabilitated roof performance when tested in accordance with ASTM E108, based upon manufacturer's tests of identical applications.

2.3 MATERIALS

A. General: Re-coating materials recommended by roofing system manufacturer for intended use and compatible with components of existing membrane roofing system.

B. Infill Materials: Where required to replace test cores and to patch existing roofing, use infill materials matching existing membrane roofing system materials, unless otherwise indicated.

1. Polyisocyanurate and Cover Board Infills:

    a. Match existing removals thickness and taper.

2. Roof Patching Materials:

    a. Granule-Surfaced Cap Sheet: SBS-modified bitumen, ASTM D 6163, Type I, Grade G.

        1) Tremco, POWERply Standard FR, Basis of design.

        2) Thickness: 120 mils minimum.

    b. Base Ply: SBS-modified bitumen, ASTM D 6163, Type III, Grade S.

        1) Tremco, POWERply Heavy Duty Base, Basis of design.

        2) Thickness: 120 mils minimum.

    c. Cold Adhesive: Low Odor, Two-Part, Polyurethane Adhesive.

        1) Tremco, POWERply Endure BIO TF Adhesive, Basis of design.

        2) Volume Solids 100%, ASTM D2697.

        3) Weight Solids 100%, ASTM D1644.

        4) Volatile Organic Content (VOC), 0 g/L ASTM D3960.

        5) Application Rate: Two gallons per 100 square feet, per ply.

C. Temporary Roof Drainage: Design and selection of materials for temporary roof drainage are responsibilities of the Contractor.

2.4 FLUID-APPLIED ROOFING MEMBRANE

A. Polyurethane Elastomeric Fluid-Applied System: Two-coat fluid-applied roofing membrane formulated for application over prepared existing roofing substrate.

1. Polyurethane Roof Coating System Base Coat: Single-part moisture-curing, for use with a compatible top coat.

    a. Basis of design product: Tremco, AlphaGuard MTS Base Coat.

    b. Combustion Characteristics, UL790: Maintains combustion characteristics of existing roof system.

    c. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 50 g/L.

    d. Accelerated Weathering, 5000 hours, ASTM G154: Pass.

    e. Hardness, Shore A, minimum, ASTM D2240: 85.

    f. Solids, by volume, ASTM D2697, minimum: 87 percent.

g. Minimum Thickness, Base Coat on Granular MB: 64 mils (1.62 mm) wet.

2. Polyurethane roof coating system top coat, low odor low VOC single-part, for application over compatible base coat.

a. Basis of design product: Tremco, AlphaGuard MT Top Coat.

b. Combustion Characteristics, UL790: Maintains combustion characteristics of existing roof system.

c. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 50 g/L.

d. Accelerated Weathering, 5000 hours, ASTM G154: Pass.

e. Hardness, Shore A, minimum, ASTM D2240: 85.

f. Solids, by volume, ASTM D2697: 87.

g. Minimum Thickness: 48 mils (1.22 mm) wet over cured base coat.

h. Minimum Thickness, Slip-Resistant Coat: 20 mils (0.50 mm) wet.

i. Color: Patina Green, or as approved by Architect..

B. Primers:

1. Primer for Asphaltic and Single-Ply Membranes: Water-based, polymer-modified quick-dry low odor primer.

a. Basis of design product: Tremco, AlphaGuard WB Primer.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 1 g/L.

c. Solids, by weight: 70 percent.

2. Primer for Masonry Surfaces: Two-part high-solids epoxy-penetrating low-odor primer for masonry and concrete surfaces.

a. Basis of design product: Tremco, AlphaGuard C-Prime.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

c. Solids, by weight: 100 percent.

3. Primer for Non-Porous Surfaces: Single-part, water based primer to promote adhesion of urethanes to metals, PVC and other non-porous surfaces.

a. Basis of design product: Tremco, AlphaGuard M-Prime.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 22 g/L.

c. Nonvolatile Content, minimum, ASTM D2369: 5 percent.

d. Density at 77 deg F (25 deg C): 8.3 lb./gal (1kg/L).

4. Primer for Intercoat and Substrate Adhesion: Single-part, quick-drying primer to promote adhesion of urethane products to previous urethane coats and to other approved surfaces.

    a. Basis of design product: Tremco, Geogard Primer.

    b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 100 g/L.

    c. Coverage Rate, 400 sq. ft/ gal. (10 m2/ L): 4 mils (0.10 mm) wet.

C. Fluid-Applied Membrane Reinforcing Fabric:

1. Polyester Reinforcing Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings and as a protection layer under pavers or stone aggregates.

    a. Basis of design product: Tremco, Permafab.

    b. Tensile Strength, Minimum, ASTM D5034 (2-inch): MD - 110 lbs. (49.8 kg); XMD - 60 lbs. (27.2 kg) avg.

    c. Elongation, Minimum, ASTM D5034 (1-inch): MD - 25 percent; XMD - 100 percent.

    d. Tear Strength, Minimum, ASTM D5587: MD - 20 lbs. (9.0 kg) avg; XMD - 20 lbs. (9.0 kg) avg.

    e. Weight: 3 oz./sq. yd (102 g/sq. m).

2. Glass Fiber Reinforcing Fabric: Medium-fine fiber, rapid wetting chopped strand mat intended for reinforcement of compatible fluid-applied membranes and flashings.

    a. Basis of design product: Tremco, AlphaGuard Glass Mat.

    b. Binder: Highly soluble powdered polyester.

2.5 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with existing roofing system and fluid-applied roofing system.

B. Seam Sealer: Waterproof seam and patching material compatible with applied coating.

1. Seam Sealer: Aromatic polyurethane sealer, single-component, high solids, moisture curing, formulated for compatibility and use with a variety of roofing and flashing substrates.

    a. Basis of design product: Tremco, GEOGARD Seam Sealer.

    b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 189 g/L.

    c. Tensile Strength, ASTM D412: 270 psi (1860 kPa).

    d. Tear Strength, ASTM D412: 35 pli (6.13 kNm).

    e. Elongation, ASTM D412: 220 percent.

f. Color: Gray.

C. Joint Sealant: Elastomeric joint sealant compatible with applied coating, with movement capability appropriate for application.

1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.

a. Basis of design product: Tremco, TremSEAL Pro.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.

c. Hardness, Shore A, ASTM C661: 40.

d. Adhesion to Concrete, ASTM C794: 35 pli.

e. Tensile Strength, ASTM D412: 350 psi (2410 kPa).

f. Color: Closest match to substrate.

D. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM 4470; designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.

E. Metal Flashing Sheet: Provide metal flashing sheet matching type, thickness, finish, and profile of existing metal flashing and trim.

F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.6 SLIP RESISTANT SURFACING

A. Materials:

1. Polyurethane Top Coat, Slip-Resistant: Second top coat with broadcast slip-resistant aggregate.

a. Basis of design product: Tremco, AlphaGuard MT Top Coat Slip-Resistant.

b. Minimum Thickness: As indicated in Part 2 product listing; over cured top coat.

c. Ceramic granules: 10 to 15 lb./100 sq. ft.

d. Color: Patina Green.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing roofing substrates, with Installer present, for compliance with requirements and for other conditions affecting application and performance of roof coatings.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.

2. Verify compatibility of approved re-coating system with and suitability of substrates.

3. Verify that substrates are visibly dry and free of moisture.

4. Verify that roofing membrane surfaces have adequately aged to enable proper bond with re-coating system base coat.

5. Verify that existing roofing membrane is free of blisters, splits, open laps, indications of shrinkage, and puncture damage or other indications of impending roof system failure.

6. Commencing application of fluid-applied re-coating membrane indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect existing roofing system that is indicated not to be rehabilitated, and adjacent portions of building and building equipment.

1. Mask surfaces to be protected. Seal joints subject to infiltration by coating materials.

2. Limit traffic and material storage to areas of existing roofing membrane that have been protected.

3. Maintain temporary protection and leave in place until replacement roofing has been completed.

B. Pollution Control: Comply with environmental regulations of authorities having jurisdiction. Limit spread of dust and debris.

1. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

2. Remove debris from building roof by chute, hoist, or other device that will convey debris to grade.

C. Shut down air intake equipment in the vicinity of the Work in coordination with the Owner. Cover air intake louvers before proceeding with re-coating work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.

D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

3.3 ROOFING COATING PREPARATION

A. Removal of Wet Insulation: Remove portions of roofing membrane with underlying wet insulation. Remove wet insulation, fill in tear-off areas to match existing insulation and membrane, and prepare patched membrane for roof coating application specified below.

1. Remove roofing and wet insulation components at indicated wet areas down to roof deck.

2. Repair existing vapor barrier, if any, as needed with base ply adhered in polyurethane adhesive.

3. Infill with new insulation and cover board matching removals in-kind. Attached to deck per manufacturer's requirements.

4. Adhere two-ply SBS-modified roofing patch in polyurethane adhesive.

5. Extend adhered repair roofing six inches onto existing primed roofing and seal perimeters with a three-course of polyurethane seam sealer and reinforcing fabric.

B. Repair of Ponding Areas: Repair areas indicated as ponding areas or areas of inadequate drainage by removing roof membrane, adding additional insulation as required to provide minimum slopes to drain required by roofing rehabilitation coating manufacturer, and replace membrane with material matching existing. Submit photographic report indicating compliance.

C. Membrane Surface Preparation:

1. Remove loose granular aggregate from granular aggregate-surfaced built-up bituminous roofing with a power broom.

2. Remove pavers and walkway pads from roofing membrane.

3. Remove blisters, ridges, buckles, roofing membrane fastener buttons projecting above the membrane, and other substrate irregularities from existing roofing membrane that would inhibit application of uniform, waterproof coating.

4. Broom clean existing substrate.

5. Substrate Cleaning: Clean substrate in accordance with requirements of Division 07 Section "Maintenance Cleaning of Membrane Roofing."

6. Verify that existing substrate is dry before proceeding with application of coating. Spot check substrates with an electrical capacitance moisture-detection meter.

7. Verify adhesion of new products.

D. Existing Flashing and Detail Preparation: Repair flashings, gravel stops, copings, and other roof-related sheet metal and trim elements. Reseal joints, replace loose or missing fasteners, and replace components where required to leave in a watertight condition.

1. Do not damage metal counter flashings that are to remain. Replace metal counter flashings damaged during removal with counter flashings of same metal, weight or thickness, and finish.

2. Roof Drains: Remove drain strainer and clamping ring. Grind metal surfaces down to clean, bare, metal.

E. Surface Priming: Prime surfaces to receive fluid-applied coating using coating manufacturer's recommended product for surface material. Apply at application rate recommended by manufacturer.

1. Ensure primer does not puddle and substrate has complete coverage.

2. Allow to cure completely prior to application of coating.

3.4 FLUID-APPLIED FLASHING APPLICATION

A. Fluid-Applied Flashing and Detail Base Coat Application: Complete base coat and fabric reinforcement at parapets, curbs, penetrations, and drains prior to application of field of fluid-applied membrane. Apply base coat in accordance with manufacturer's written instructions.

1. Apply base coat on prepared and primed surfaces and spread coating evenly. Extend coating minimum of 8 inches (200 mm) up vertical surfaces and 4 inches (100 mm) onto horizontal surfaces.

2. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

3. Fabric Reinforcement: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

4. Roof Drains: Install base coat onto surrounding membrane surface and metal drain bowl flange. Install target piece of fabric reinforcement immediately into wet base coat and roll to fully embed and saturate fabric. Reinstall clamping ring and strainer following application of top coat. Replace broken drain ring clamping bolts.

5. Allow base coat to cure prior to application of top coat.

3.5 FLUID-APPLIED MEMBRANE APPLICATION

A. Fluid-Applied Membrane Base Coat: Apply base coat to field of membrane in accordance with manufacturer's written instructions.

1. Apply base coat on prepared and primed surfaces and spread coating evenly.

2. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

3. Fabric Reinforcement: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

b. Following curing of base coat and prior to application of top coat, sand raised or exposed edges of fabric reinforcement.

B. Top Coat Application: Apply top coat to field of membrane and flashings uniformly in a complete, continuous installation.

1. Allow base coat to cure prior to application of top coat.

2. Following curing of base coat and prior to application of top coat, sand raised or exposed edges of fabric reinforcement.

3. Prime base coat prior to application of top coat if top coat is not applied within 72 hours of the base coat application, using manufacturer's recommended primer.

4. Apply top coat extending coating up vertical surfaces and out onto horizontal surfaces. Install top coat over field base coat and spread coating evenly.

5. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

6. Avoid foot traffic on new fluid-applied membrane for a minimum of 24 hours.

C. Slip Resistant Walkway Top Coat Installation

1. Slip-Resistant Walkway Topcoat: Apply walkway second topcoat following application and curing of top coat.

a. Locate on entire horizontal roofing surface.

D. Mask walkway location with tape.

E. Prime first top coat prior to application of walkway top coat if walkway top coat is not applied within 72 hours of the first top coat application, using manufacturer's recommended primer.

F. Apply walkway topcoat and back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

G. Broadcast Slip-Resistant Top Coat Aggregate in wet top coat at rate indicated in Part 2 product listing or as otherwise recommended by coating manufacturer.

H. Back roll aggregate and top coat creating even dispersal of aggregate.

3.6 FIELD QUALITY CONTROL

A. Roof Inspection: Engage roofing system manufacturer's technical personnel to inspect roofing installation and submit report. Notify Architect 48 hours in advance of dates and times of inspections. Inspect work as follows:

1. Upon completion of preparation of roof coating substrate, prior to application of coating materials.

2. Following application of coating to flashings and application of base coat to field of roof.

3. Upon completion of coating but prior to re-installation of other roofing components.

B. Repair fluid-applied membrane where test inspections indicate that they do not comply with specified requirements.

C. Arrange for additional inspections, at Contractor's expense, to verify compliance of replaced or additional work with specified requirements.

3.7 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

3.8 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove coating that does not comply with requirements, repair substrates, and reapply coating.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 070150

SECTION 07-0150.16
MAINTENANCE CLEANING OF MODIFIED BITUMINOUS ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pressure washing of roof membrane including membrane flashings, with full water reclamation.

B. Related Requirements:

1. Division 07 Rehabilitation of Modified Bituminous Roofing section for repair and restoration coating of roofing membranes.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning compounds.

1.3 INFORMATIONAL SUBMITTALS

A. Work Plan: For maintenance cleaning, including description of means and methods for water reclamation.

1.4 QUALITY ASSURANCE

A. Operator Qualifications: Trained and approved by manufacturer of cleaning equipment, with a record of successful roofing membrane cleaning.

B. Regulatory Requirements: Comply with governing EPA regulations. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.5 PROJECT / FIELD CONDITIONS

A. Owner will occupy portions of building immediately below roof area to be maintained. Conduct operations so Owner's operations are not disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

B. Protect building to be cleaned, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from maintenance operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

PART 2 - PRODUCTS

2.1 CLEANING SYSTEM OPERATORS

A. Source Limitations: Engage a qualified roofing maintenance cleaning firm to perform cleaning of membrane roofing.

B. Approved Operators: RoofTec Cleaning Systems, Tremco CPG Inc., Beachwood OH, (800) 562-2728.

2.2 PERFORMANCE REQUIREMENTS

A. Water Reclamation: Provide maintenance cleaning of membrane roofing that provides 100 percent reclamation of cleaning water and complies with applicable provisions of the US EPA National Pollutant Discharge Elimination System (NPDES) program and requirements of local authorities having jurisdiction.

2.3 MATERIALS

A. Pre-cleaning Treatment: Detergent-free.

1. Product: Tremco, RoofTec PREKLEEN.

B. Pressure Wash Cleaning Solution: VOC, detergent, phosphate, and surfactant free.

1. Product: Tremco, RoofTec RENEW Cleaner.

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with warranty requirements of existing roof membrane manufacturer.

B. Shut off rooftop utilities and service piping before beginning the Work.

C. Test existing roof drains to verify that they are not blocked or restricted. Immediately notify Owner of any blockages or restrictions.

D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with maintenance cleaning work that could affect indoor air quality or activate smoke detectors in the ductwork.

E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors.

3.2 MAINTENANCE CLEANING OF ROOF MEMBRANE

A. Pretreat membrane and flashings when recommended by cleaning equipment manufacturer based upon site assessment of membrane condition.

B. Apply pressure wash cleaning solution onto membrane and flashing surfaces.

C. Pressure wash membrane and flashings using equipment and methods recommended in writing by cleaning equipment manufacturer for specific application. Utilize rotating wash head equipment operated at not less than 2,000 psi (13,800 kPa). Use equipment utilizing vacuum removal of wash water and residues

3.3 DISPOSAL

A. Collect cleaning water and associated cleaning compounds and residual material and process to meet US EPA and local environmental requirements for legal discharge.

END OF SECTION 070150.16

SECTION 07 1113
BITUMINOUS DAMPPROOFING

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. Bituminous dampproofing

B. Exterior, below-grade surfaces of concrete foundation walls and structures.

C. Exterior face of inner wythe of exterior masonry cavity walls.

D. Interior face of exterior concrete and masonry walls, above grade.

E. Exterior columns, beams, lintels , and hangers not receiving concealed flashings or embedded in concrete.

F. Protection boards.

G. Drainage panels.

1.3 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Rigid insulation board used as protection board.

B. Section 04 2000 - Unit Masonry.

1.4 REFERENCE STANDARDS

A. ASTM D449/D449M - Standard Specification for Asphalt Used in Dampproofing and Waterproofing; 2003 (Reapproved 2021).

B. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2018).

C. ASTM D1227/D1227M - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013, with Editorial Revision (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. 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 MANUFACTURERS

A. W.R. Meadows, Inc: www.wrmeadows.com/sle.

1. Substitutions: See Section 01 6000 - Product Requirements.

2.3 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: See Section 01 6000 - Product Requirements.

2.4 ACCESSORIES

A. Protection Board: Rigid insulation; see Section 07 2100.

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 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Patch disturbed areas of existing dampproofing with two coats of new dampproofing of the same generic type.

C. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

D. Prime surfaces at a rate approved by manufacturer for application indicated, and allow primer to dry thoroughly.

E. Apply bitumen with roller.

F. 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.

G. Apply from 2 inches (50 mm) below finish grade elevation down to top of footings.

H. Seal items watertight with mastic, that project through dampproofing surface.

I. 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

J. 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.

K. 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.

L. 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

M. 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.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, general provisions of the Agreement between Owner and Contractor and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slabs, and over roof deck.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Concealed building insulation.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.4 DEFINITIONS

A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.

B. Section 04200 - Unit Masonry
   1. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.

C. Section 05 4000 - Cold-Formed Metal Framing: Board insulation as wall sheathing.
   1. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

D. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.

E. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2017.

F. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.

G. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

H. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.5 REFERENCE STANDARDS

A. ASTM C272 Water Absorption

B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2017.

G. ASTM D 696 Coefficient of Linear Thermal Expansion.

H. ASTM D1621 Compressive Strength.

I. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

K. ASTM E 119 Fire-Resistance Ratings

L. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

1.6 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.

1.7 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.8 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.

C.

1.9 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: 15 years.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation Inside Masonry Cavity Walls: Expanded polystyrene (EPS) board.

D. Insulation on Inside of Concrete and Masonry Exterior Walls: Extruded polystyrene (XPS) board.

E. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

F. Insulation Over Roof Deck: Polyisocyanurate board. Mechanically fastened

2.2 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.

2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
3. Board Size: 48 x 96 inch (1220 x 2440 mm), and 16" x 96 for cavity wall
4. Board Thickness: 1-1/2 inch (38 mm).
5. Board Edges: Tongue-and-groove.
6. Type and Water Absorption: Type XI, 4.0 percent by volume, maximum, by total immersion.
7. Board Density: 0.7 lb/cu ft (12 kg/cu m).
8. Compressive Resistance: 5 psi (35 kPa).
9. Thermal Conductivity (k factor) at 25 degrees F (-3.9 degrees C): 0.28 (0.48).
10. Products:
    a. AFM Corp: www.r-control.com/#sle.
11. Substitutions: See Section 01 6000 - Product Requirements.

B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index (SDI): 450 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: 2.125 inches (____ mm).
7. Board Edges: Square.
8. Thermal Resistance: per inch, ASTM C518 @ 75°F R-value 5.0
9. Compressive Resistance: 30 psi (____ kPa).
10. Water Absorption, maximum: 0.1 percent, volume.
11. Manufacturer: Dow Chemical Co. "Styrofoam Perimate".
    a. "Styrofoam Perimate" Use for vertical foundation walls.
    b. "Styrofoam SM" . Use for under slabs

C. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
1. Classifications:
    a. Type I: Faced with aluminum foil on both major surfaces of the core foam.
        a) Class 1 - Non-reinforced core foam.
        b) Compressive Strength: 16 psi (110 kPa), minimum.
        c) Thermal Resistance, R-value (RSI-value): At 1-1/2 inch (38.1 mm) thick; 9.0 (1.59), minimum, at 75 degrees F (24 degrees C).
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
4. Board Thickness: Varies , see drawings .
5. Tapered Board: Slope as indicated; minimum thickness , 1/4"; fabricate of fewest layers possible.
6. Board Edges: Square.

2.3 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.

4. Formaldehyde Content: Zero.

C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.

2.4 ACCESSORIES

A. Adhesive: Type recommended by insulation manufacturer for application.

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 honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Apply adhesive to back of boards:
   1. Three continuous beads per board length.

B. Install boards vertically on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Extend boards over expansion joints, unbonded to foundation on one side of joint.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION AT EXTERIOR WALLS

A. 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.

B. Extend boards over expansion joints, unbonded to wall on one side of joint.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

D. Tape insulation board joints.

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.

3.5 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall, roof, and ceiling 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.

3.6 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.7 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. Fluid-applied, vapor permeable weather barrier membrane Water-Resistive Barrier:

B. Air Barriers: Materials that form a system to stop passage of air through exterior walls and joints around frames of openings in exterior walls.

C. Fasteners

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 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.

D. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

E. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

F. Section 07 9200 - Joint Sealants: Sealing building expansion joints.

1.4 DEFINITIONS

A. Weather Barrier: 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: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

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 D882; Test Method for Tensile Properties of Thin Plastic Sheeting

D. ASTM D 2240 - Standard Test Method for Rubber Property - Durometer Hardness.

E. ASTM D 4541 - Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

H. 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.

I. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylight, Doors and Curtain Walls by Uniform Static Air Pressure Differences.

J. ASTM E 779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.

K. ASTM E 783 - Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.

L. 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.

M. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls

N. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

O. ASTM E 2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

P. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

Q. AATCC Test Method 127 Water Resistance: Hydrostatic Pressure Test.

R. TAPPI Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area).

S. 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.

F. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier system installation

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspection of specified product in this section.

1.10 MOCK-UP

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

1.11 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.12 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.

1.13 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

1.14 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 WEATHER BARRIER ASSEMBLIES

A. Fluid applied, vapor permeable weather barrier membrane water resistive barrier.

B. Location:
   1. On outside surface of CMU at cavity walls and as indicated on drawings.

2.2 VAPOR RETARDER M ATERIALS (AIR BARRIER AND WATER-RESISTIVE)

A. Primary liquid/air/vapor barrier membrane for temperatures above 40 degrees F shall be one component elastomeric membrane, trowel or spray applied, compatibility with substrates, transition membranes and insulation. Membrane shall have the physical properties of the product specified as the basis of design:
   1. **Air-Bloc 32 MR as manufactured by Henry Company. 800 598 7663.** (or approved equal, see substitutions Section. Substitution shall meet or exceed the qualities of the basis of design

including air permeability (0.00012 cfm/sf @ 1.6 psf) , water vapor permeance (0.08 perms), VOC content, (less than 100g/l) fungal rating (0), air leakage and elastic recovery characteristics. Include meeting the ASTM references associated with each characteristic of the basis of design.)

2.3 SEALANTS

A. Polyurethane Sealant: as specified in Section 07 9200 - Joint Sealants.

B. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.4 ADHESIVES

A. Provide adhesive recommended by weather barrier manufacturer.

2.5 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Joint Treatment.

1. Joint Compound: Fluid-applied, vapor permeable, elastomeric flashing material; trowel applied.
   a. Product: As per manufacturers recommendation.

C. Fasteners: 1-5/8 inch rust resistant screw with 2-inch diameter plastic cap or manufacturer approved 1-1/4" or 2" metal gasketed washer.

D. 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 are ready to accept the work 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 instructions.

B. 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 as recommended by manufacturer to achieve 110 mils, providing a consistent and uniform 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. For temperatures above 40 degrees F and rising, apply one component water based elastomeric emulsion air/vapor barrier membrane at a rate 14 sf per gallon to a uniform wet thickness of 110 mils.

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:

D. Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation

E. Do not cover installed water-resistive barriers until required inspections have been completed.

F. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

G. Take digital photographs of each portion of the installation prior to covering up.

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 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. Factory pre-finished, pre-fabricated exposed fastener metal wall panels.

D. Accessories, fasteners, and sealants.

1.3 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications.

B. Section 06 1000 - Rough Carpentry.

C. Section 07 6200 - Sheet Metal Flashing and Trim.

D. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

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; 2017.

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.

F. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installer of the items involved:

1. Roof panels and attachments
2. Metal trusses, bracings and supports
3. Light Fixture locations

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. Correct defective work within a five year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

C. 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. Color fading more than 5 hunter units when tested according to ASTM D 2244
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214
      c. 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

2.2 ALUMINUM SOFFIT PANELS

A. Aluminum Soffit Panels:
   1. Style: 7" w, Flush Solid Panels
      a. Thickness: Nominal 0.04; aluminum alloy 3105-H14:
   2. Color: As selected by Architect from manufacturer's full line.

2.3 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over polyester primer.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

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 soffit panel 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 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 as required for miscellaneous roof repairs.
   3. Perform Waste Management; coordinate with Section 01 7419.
      a. Related Requirements
         a) Masonry - Division 4
         b) Sheet Metal Flashing & Accessories - Section 07 6200
         c) Roof Related Carpentry - Division 6
         d) Roof Specialties - Section 07 7100

1.3 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.

1.4 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 protected and complete the work on schedule.
   7. A schedule for Manufacturer and Architects inspection.

1.5 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.

1.6 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.

1.7 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.

1.8 GUARANTEE/WARRANTY

A. 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.

B. Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.

C. 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.

D. 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.

E. 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.

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. 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
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:

	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. 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.
    a. Wall and Curb Flashing: G410 fiberglass reinforced PVC, color to match the color of the roof
    b. Pitch Pocket Filler: Two component urethane sealant.
    c. Corners: Prefabricated outside and inside flashing corners factory formed of 60 mil thick unreinforced PVC, color to match the color of the roof.
    d. Sealant: One component acrylic-based resin blended with solvent and inorganic adhesives.
    e. PVC Adhesive: Solvent-based reactivating-type adhesive, Sarnacol 2170.
    f. Insulation Plates: 3 inch square, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating.
    g. Fasteners: #14 corrosion-resistant screws.
    h. Aluminum Tape: 2 inch wide pressure-sensitive aluminum tape.
    i. 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.

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. 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.

3.7 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.

3.8 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.

3.9 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 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.

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.

END OF SECTION

SECTION 075600.13
FLUID-APPLIED MEMBRANE ROOFING, INSULATED

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fluid-applied roof membrane system on insulated metal deck, consisting of the following:

1. Substrate board.
2. Vapor retarder.
3. Roof insulation and cover board.
4. Base-ply sheet.
5. Application of reinforced fluid-applied polyurethane roof membrane and membrane flashings.

B. Related Information:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and nailers.
2. Division 07 Section "Sheet Metal Flashing and Trim" for manufactured reglets, formed metal roof flashings, expansion joints, copings, and roof edge metal.
3. Division 07 Section "Roof Specialties" for manufactured copings and roof edge metal.
4. Division 22 Section "Storm Drainage Piping Specialties" for new or replacement roof drains.

1.2 ROOFING CONFERENCES

A. Roofing Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to roofing system.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative if applicable, roofing materials manufacturer's representative, roofing Installer including project manager and foreman, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment requiring removal and replacement as part of the Work.
2. Review methods and procedures related to preparation, including membrane roofing system manufacturer's written instructions.
3. Review drawings and specifications.
4. Review temporary protection requirements for existing roofing system that is to remain, during and after installation.
5. Review roof drainage during each stage of roofing and review roof drain plugging and plug removal procedures.

6. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

7. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect re-coating.

8. Review HVAC shutdown and sealing of air intakes.

9. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.

10. Review procedures for asbestos removal or unexpected discovery of asbestos-containing materials.

11. Review governing regulations and requirements for insurance and certificates if applicable.

12. Review existing conditions that may require notification of Owner before proceeding.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and terminations.

2. Tapered insulation, including slopes.

3. Crickets, saddles, and tapered edge strips, including slopes.

4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. 8-by-10-inch (200-by-250 mm) square of fluid-applied membrane, and sheet materials.

2. 8-by-10-inch (200-by-250 mm) square of roof insulation and cover board.

3. Walkway pads.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

B. Qualification Data: For Installer and Roofing Inspector.

1. Letter written for this Project indicating manufacturer approval of Installer to apply specified products and provide specified warranty.

C. Manufacturer's Certificate: Submit letter showing compliance with performance requirements, including wind uplift resistance for submitted assembly.

D. Warranties: Unexecuted sample copies of special warranties.

E. Inspection Reports: Reports of Roofing Inspector. Include description of work performed, defective work observed, and corrective actions required and carried out.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

B. Warranties: Executed copies of approved warranty forms.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and the following:

1. Qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section, with minimum five years' experience in manufacture of specified products in successful use in similar applications.

1. Approval of Other Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.

b. Samples of each component.

c. Sample submittal from similar project.

d. Project references: Minimum of five installations of specified products not less than five years old, with Owner and Architect contact information.

e. Sample warranty.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Handle and store roofing materials, and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

C. Protect materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting.

1.9 PROJECT / FIELD CONDITIONS

A. Protect building, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roofing operations.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

C. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

1. Store all materials prior to application at temperatures between 60 and 90 deg. F (16 and 32 deg C).

2. Apply coatings within range of ambient and substrate temperatures recommended by manufacturer. Do not apply materials when air temperature is below 50 or above 110 deg. F (10 or above 43 deg C).

3. Do not apply roofing in snow, rain, fog, or mist.

D. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

E. Owner will occupy portions of building immediately below roofing area. Conduct roofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1.10 WARRANTY

A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.

1. Form of Warranty: Manufacturer's standard warranty form.

2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.

3. Warranty Period: 30 years from date of completion.

B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.

1. Inspections to occur in following years: 2, 5, 10, 15, 20 and 25 following completion.

C. Installer Warranty: Installer's warranty signed by Installer, as follows.

1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.

2. Scope of Warranty: Work of this Section.

3. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products or comparable products of one of the following.

1. Tremco CPG Inc., Basis of Design.

2. Kemper.

3. Pacific Polymers.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency in accordance with ANSI/FM 4474, UL 580, or UL 1897, and to resist uplift pressures.

1. Zone 1 (Field-of-Roof) Uplift Pressure: 60 psf.

2. Zone 2 (Perimeter) Uplift Pressure: 100 psf, located within 18 ft. of roof perimeter.

3. Zone 3 (Corner) Uplift Pressure: 150 psf, located within 6 ft. of outside corners.

D. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to ANSI/SPRI ES-1.

1. Design Pressure: 150 psf.

E. Flashings: Comply with requirements of Division 07 Sections "Sheet Metal Flashing and Trim" and "Manufactured Roof Specialties." Provide base flashings, perimeter flashings, detail flashings and component materials that comply with requirements and recommendations of the following:

1. FMG 1-49 Loss Prevention Data Sheet for Perimeter Flashings.

2. FMG 1-29 Loss Prevention Data Sheet for Above Deck Roof Components.

3. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.

4. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.

F. Exterior Fire-Test Exposure: ASTM E108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

2.3 MATERIALS

A. General: Roofing materials recommended by roofing system manufacturer for intended use and compatible with components of existing membrane roofing system.

B. General: Provide adhesive and sealant materials recommended by roofing manufacturer for intended use and compatible with built-up roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2.4 SHEET MATERIALS

A. Base-Ply Sheet:

1. SBS-modified asphalt coated composite polyester/fiberglass/fiberglass mat trilaminate-reinforced high tensile strength base sheet, ASTM D4601 Type II.

a. Basis of design product: Tremco, BURmastic Composite Ply HT.

b. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 165 lbf/in (725 N); Cross machine direction, 150 lbf/in (660 N).

c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 260 lbf (1150 N); Cross machine direction, 230 lbf (1120 N).

d. Thickness, minimum, ASTM D5147: 0.060 inch (1.5 mm).

2.5 FLUID-APPLIED ROOFING MEMBRANE

A. Polyurethane Elastomeric Fluid-Applied System: Two-coat reinforced fluid-applied roofing membrane formulated for application over prepared existing roofing substrate.

1. Base Coat:

a. Polyurethane Roof Coating System Base Coat: Single-part moisture-curing, for use with a compatible top coat.

1) Basis of design product: Tremco, AlphaGuard MTS Base Coat.

2) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 50 g/L.

3) Accelerated Weathering, 5000 hours, ASTM G154: Pass.

4) Hardness, Shore A, minimum, ASTM D2240: 85.

5) Solids, by volume, ASTM D2697, minimum: 87 percent.

6) Minimum Thickness, Base Coat on Smooth Surface: 48 mils (1.22 mm) wet.

2. Top Coat:

a. Polyurethane roof coating system top coat, low odor low VOC single-part, for application over compatible base coat.

1) Basis of design product: Tremco, AlphaGuard MT Top Coat.

2) Combustion Characteristics, UL790: Maintains combustion characteristics of existing roof system.

3) Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 50 g/L.

4) Solar Reflectance Index (SRI), ASTM C1549: 86 percent.

5) Accelerated Weathering, 5000 hours, ASTM G154: Pass.

6) Hardness, Shore A, minimum, ASTM D2240: 85.

7) Solids, by volume, ASTM D2697: 87.

8) Minimum Thickness: 48 mils (1.22 mm) wet over cured base coat.

9) Minimum Thickness, Slip-Resistant Coat: 20 mils (0.50 mm) wet.

10) Color: Patina Green.

3. Reinforcing Fabric:

   a. Polyester Reinforcing Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings and as a protection layer under pavers or stone aggregates.

      1) Basis of design product: Tremco, Permafab.

      2) Tensile Strength, Minimum, ASTM D5034 (2-inch): MD - 110 lbs. (49.8 kg); XMD - 60 lbs. (27.2 kg) avg.

      3) Elongation, Minimum, ASTM D5034 (1-inch): MD - 25 percent; XMD - 100 percent.

      4) Tear Strength, Minimum, ASTM D5587: MD - 20 lbs. (9.0 kg) avg; XMD - 20 lbs. (9.0 kg) avg.

      5) Weight: 3 oz./sq. yd (102 g/sq. m).

4. Primers:

   a. Primer for Asphaltic and Single-Ply Membranes: Water-based, polymer-modified quick-dry low odor primer.

      1) Basis of design product: Tremco, AlphaGuard WB Primer.

      2) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 1 g/L.

      3) Solids, by weight: 70 percent.

   b. Primer for Masonry Surfaces: Two-part high-solids epoxy-penetrating low-odor primer for masonry and concrete surfaces.

      1) Basis of design product: Tremco, AlphaGuard C-Prime.

      2) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

      3) Solids, by weight: 100 percent.

   c. Primer for Non-Porous Surfaces: Single-part, water based primer to promote adhesion of urethanes to metals, PVC and other non-porous surfaces.

      1) Basis of design product: Tremco, AlphaGuard M-Prime.

      2) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 22 g/L.

      3) Nonvolatile Content, minimum, ASTM D2369: 5 percent.

      4) Density at 77 deg F (25 deg C): 8.3 lb./gal (1kg/L).

   d. Primer for Intercoat and Substrate Adhesion: Single-part, quick-drying primer to promote adhesion of urethane products to previous urethane coats and to other approved surfaces.

1) Basis of design product: Tremco, Geogard Primer.

2) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 100 g/L.

3) Coverage Rate, 400 sq. ft/ gal. (10 m2/ L): 4 mils (0.10 mm) wet.

2.6 ADHESIVE MATERIALS

A. Base-Ply Sheet Adhesive:

1. Cold-applied bio-based low odor urethane roofing adhesive, two-part, USDA BioPreferred, formulated for compatibility and use with specified roofing membranes and flashings.

a. Basis of design product: Tremco, POWERply Endure BIO Adhesive TF.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3690: 0 g/L.

c. Low Temperature Flexibility, ASTM D2240: Pass at -30 deg F (-34 deg C).

d. Solids, by Volume, ASTM D2697: 100 percent.

e. Biobase Content, Minimum, ASTM D6866: 70 percent.

2.7 AUXILIARY ROOFING MEMBRANE MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with existing roofing system and fluid-applied roofing system.

B. Joint Sealant: Elastomeric joint sealant compatible with applied coating, with movement capability appropriate for application.

1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.

a. Basis of design product: Tremco, TremSEAL Pro.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.

c. Hardness, Shore A, ASTM C661: 40.

d. Adhesion to Concrete, ASTM C794: 35 pli.

e. Tensile Strength, ASTM D412: 350 psi (2410 kPa).

f. Color: Closest match to substrate.

C. Stripping Adhesive / Sealer:

1. Seam Sealer: Aromatic polyurethane sealer, single-component, high solids, moisture curing, formulated for compatibility and use with a variety of roofing and flashing substrates.

a. Basis of design product: Tremco, GEOGARD Seam Sealer.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 189 g/L.

c. Tensile Strength, ASTM D412: 270 psi (1860 kPa).

d. Tear Strength, ASTM D412: 35 pli (6.13 kNm).

e. Elongation, ASTM D412: 220 percent.

f. Color: Gray.

D. Drain Flashing: Choose from one of the following:

1. Sheet lead 4 lb.

2. Copper, mill finish, malleable, 16 oz. minimum.

E. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.8 SUBSTRATE BOARDS

A. Substrate Boards:

1. Gypsum panel, cellulosic fiber reinforced, water-resistant, ASTM C1278/C1278M.

a. Basis of design product: USG Securock Gypsum Fiber Roof Board.

b. Thickness: 1/2 inch (13 mm).

B. Fasteners: Factory-coated steel #14 HD fasteners and 3-inch metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.9 VAPOR RETARDER/AIR BARRIER

A. Vapor Retarder Sheet:

1. SBS-modified asphalt coated composite polyester/fiberglass/fiberglass mat trilaminate-reinforced high tensile strength base sheet, ASTM D4601 Type II.

a. Basis of design product: Tremco, BURmastic Composite Ply HT.

b. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 165 lbf/in (725 N); Cross machine direction, 150 lbf/in (660 N).

c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 260 lbf (1150 N); Cross machine direction, 230 lbf (1120 N).

d. Thickness, minimum, ASTM D5147: 0.060 inch (1.5 mm).

B. Vapor Retarder Adhesive:

1. Cold-applied bio-based low odor urethane roofing adhesive, two-part, USDA BioPreferred, formulated for compatibility and use with specified roofing membranes and flashings.

    a. Basis of design product: Tremco, POWERply Endure BIO Adhesive TF.

    b. Volatile Organic Compounds (VOC), maximum, ASTM D3690: 0 g/L.

    c. Low Temperature Flexibility, ASTM D2240: Pass at -30 deg F (-34 deg C).

    d. Solids, by Volume, ASTM D2697: 100 percent.

    e. Biobase Content, Minimum, ASTM D6866: 70 percent.

2.10 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

1. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, not less than two times the roof slope.

B. Roof Insulation:

1. Board Insulation, Polyisocyanurate: CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces, ASTM C1289 Type II Class 1.

    a. Compressive Strength, ASTM D1621: Grade 2: 20 psi (138 kPa).

2.11 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with built-up roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate and acceptable to roofing manufacturer.

C. Roof Insulation Adhesive:

1. Urethane adhesive, bead-applied, low-rise two-component solvent-free low odor, formulated to adhere roof insulation to substrate.

    a. Basis of design product: Tremco, Low Rise Foam Insulation Adhesive.

    b. Flame Spread Index, ASTM E84: 10.

    c. Smoke Developed Index, ASTM E84: 30.

    d. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

e. Tensile Strength, minimum, ASTM D412: 250 psi (1720 kPa).

f. Peel Adhesion, minimum, ASTM D903: 17 lbf/in (2.50 kN/m).

D. Tapered Edge Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

E. Cover Board:

1. Gypsum panel, cellulosic fiber reinforced, water-resistant, ASTM C1278/C1278M.

a. Basis of design product: USG Securock Gypsum Fiber Roof Board.

b. Thickness: 1/2 inch (13 mm).

2.12 SLIP RESISTANT SURFACING

A. Materials:

1. Polyurethane Top Coat, Slip-Resistant: Second top coat with broadcast slip-resistant aggregate.

a. Basis of design product: Tremco, AlphaGuard MT Top Coat Slip-Resistant.

b. Minimum Thickness: As indicated in Part 2 product listing; over cured top coat.

c. Ceramic granules: 10 to 15 lb./100 sq. ft.

d. Color: Patina Green.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.

2. Metal Deck:

a. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."

b. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.

B. Proceed with installation once unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing manufacturer's written instructions. Remove sharp projections.

B. Protect existing roofing system that is indicated to remain, and adjacent portions of building and building equipment.

1. Mask surfaces to be protected. Seal joints subject to infiltration by coating materials.

2. Limit traffic and material storage to areas of existing roofing membrane that have been protected.

3. Maintain temporary protection and leave in place until replacement roofing has been completed.

C. Shut down air intake equipment in the vicinity of the Work in coordination with the Owner. Cover air intake louvers before proceeding with re-coating work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.

D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

3.3 MEMBRANE ROOFING INSTALLATION, GENERAL

A. Install roofing membrane according to roofing manufacturer's written instructions.

1. Commence installation of roofing in presence of manufacturer's technical personnel.

B. Coordinate installation of roofing so insulation and other components of roofing not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement with joints and edges sealed.

2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.

3. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Substrate-Joint Penetrations: Prevent fluid-applied materials and adhesives from penetrating substrate joints, entering building, or damaging built-up roofing components or adjacent building construction.

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck at a minimum rate of one fastener and plate per every 1.30 square feet, to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.5 VAPOR-RETARDER INSTALLATION

A. Vapor Retarder Sheet, General: Completely seal vapor retarder/air barrier at terminations, obstructions, and penetrations to prevent air movement into roofing system. Seal vapor retarder/air barrier to air barrier in adjacent construction at perimeter of roofing system.

B. SBS Modified Bituminous Membrane Sheet Vapor Retarder: Install one lapped vapor retarder course and adhere in a uniform coating of cold-applied adhesive, according to roofing system manufacturer’s written instructions.

3.6 INSULATION INSTALLATION

A. Comply with roofing manufacturer's written instructions for installing roof insulation.

B. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

C. Tapered Insulation and Crickets: Install tapered insulation under area of roofing to conform to slopes indicated.

1. Where saddles or crickets are indicated or required to provide positive slope to drain, make slope of crickets minimum of two times the roof slope.

D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

1. Tapered Insulation System for Flat Roof Deck: Install insulation as follows:

a. Minimum Continuous Insulation R-value: Not less than R-30.

2. Insulation Drain Sumps: Tapered insulation sumps, not less than 2 by 2 ft (600 by 600 mm), sloped to roof drain; sump to maximum depth of not more than 1 inch (25 mm) less than the Project-stipulated continuous insulation thickness based upon code requirements.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

H. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, maximum spacing of 6-inches on center, firmly pressing and maintaining insulation in place.

I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together.

1. Set cover board in ribbons of bead-applied insulation adhesive, maximum spacing of 6-inches on center, firmly pressing and maintaining cover in place.

3.7 BASE-PLY SHEET INSTALLATION

A. Install base sheet starting at low point of roofing. Align base sheet without stretching. Shingle side laps of base a minimum of 4 inches (100 mm). Shingle in direction to shed water. Extend base sheets over edges and terminate above cants.

1. Embed base sheet in cold-applied membrane adhesive applied at rate required by roofing manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing and 6 inches (150 mm) onto field of roofing.

C. Install stripping according to roofing manufacturer's written instructions where metal flanges and edgings are set on roofing.

1. Flashing Sheet Stripping: Install flashing sheet stripping in specified cold adhesive and extend onto roofing membrane.

D. Roof Drains: Install base-ply sheet in cold adhesive around drain bowl. Base sheet must be installed so that it will be under compression from the clamping ring. Install primed metal flashing in bed of compatible seam sealer over installed base ply and strip-in per manufacturer's requirements. Install base coat, fabric reinforcement, and top coat over base sheet. Install drain clamping ring and strainer.

3.8 FLUID-APPLIED FLASHING APPLICATION

A. Fluid-Applied Flashing and Detail Base Coat Application: Complete base coat and fabric reinforcement at parapets, curbs, penetrations, and drains prior to application of field of fluid-applied membrane. Apply base coat in accordance with manufacturer's written instructions.

1. Extend coating minimum of 8 inches (200 mm) up vertical surfaces and 4 inches onto horizontal surfaces.

2. Back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

3. Reinforcing Fabric: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

4. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

5. Roof Drains: Set 30 by 30 inch (760 by 760 mm) square metal flashing in bed of compatible mastic/adhesive sealer on roofing base-ply sheet. Cover metal flashing with stripping ply and extend a minimum of 6 inches (150 mm) beyond edge of metal flashing. Allow to cure.

    a. Apply base coat and immediately install target piece of fabric reinforcement into wet base coat, extend into drain bowl and roll to fully embed and saturate fabric. Apply top coat after base coat has cured.

    b. Following application and curing of fluid-applied roofing membrane, install clamping ring and strainer.

6. Allow base coat to cure prior to application of top coat.

3.9 FLUID-APPLIED MEMBRANE APPLICATION

A. Base Coat: Apply base coat to field of membrane in accordance with manufacturer's written instructions.

1. Apply base coat on prepared and primed surfaces and spread coating evenly.

2. Back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

3. Reinforcing Fabric: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

    a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

4. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

5. Allow base coat to cure prior to application of top coat.

B. Top Coat: Apply top coat to field of membrane and flashings uniformly in a complete, continuous installation.

1. Prime base coat prior to application of top coat if top coat is not applied within 72 hours of the base coat application, using manufacturer's recommended primer.

2. Apply top coat extending coating up vertical surfaces and out onto horizontal surfaces. Install top coat over field base coat and spread coating evenly.

3. Back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

4. Avoid foot traffic on new fluid-applied membrane for a minimum of 24 hours.

3.10 SLIP RESISTANT WALKWAY TOP COAT INSTALLATION

A. Slip-Resistant Walkway Topcoat: Apply walkway second topcoat following application and curing of top coat. Locate on entire horizontal roofing surface.

1. Mask walkway location with tape.

2. Prime first top coat prior to application of walkway top coat if walkway top coat is not applied within 72 hours of the first top coat application, using manufacturer's recommended primer.

3. Apply walkway topcoat and back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

4. Broadcast Slip-Resistant Top Coat Aggregate in wet top coat at rate indicated in Part 2 product listing or as otherwise recommended by coating manufacturer.

    a. Back roll aggregate and top coat creating even dispersal of aggregate.

5. Remove masking immediately.

3.11 FIELD QUALITY CONTROL

A. Roof Inspection: Contractor shall engage roofing system manufacturer's technical personnel to inspect roofing installation and submit report to the Architect. Notify Architect 24 hours in advance of dates and times of inspections. Inspect work as follows:

1. Upon completion of preparation of first component of work, prior to application of re-coating materials.

2. Following application of re-coating to flashings and application of base coat to field of roof.

3. Upon completion of re-coating but prior to re-installation of other roofing components.

B. Repair fluid-applied membrane where test inspections indicate that they do not comply with specified requirements.

C. Arrange for additional inspections, at Contractor's expense, to verify compliance of replaced or additional work with specified requirements.

3.12 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove coating that does not comply with requirements, repair substrates, and reapply coating.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075600.13

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, 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 6200 - Sheet Metal Flashing and Trim.

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. Sheet Metal Flashing: PVC-coated, heat-weldable sheet metal for use as perimeter edge, wall, or curb flashing.
   1. Metal Sheet: Galvanized steel complying with ASTM A653/A653M, with G90/Z275 zinc coating and at least 24-gauge, 0.0239-inch (0.61 mm) thick base metal, and 20 mil, 0.020 inch (0.5 mm) thick PVC coating laminated on one side.

F.

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. 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.

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 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 8400
FIRESTOPPING

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. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.3 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.4 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015.

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2014b.

E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a (Reapproved 2015).

F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2015b, with Editorial Revision (2016).

G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).

H. ITS (DIR) - Directory of Listed Products; current edition.

I. FM 4991 - Approval Standard for Firestop Contractors; 2013.

J. FM (AG) - FM Approval Guide; current edition.

K. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

L. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

M. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

N. 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. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.

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), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Verification of minimum three years documented experience installing work of this type.

1.7 MOCK-UP

A. 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.

B. If accepted, mock-up will represent minimum standard for the Work.

C. If accepted, mock-up may remain as part of the Work. Removed and replaced mock-ups not accepted.

1.8 FIELD CONDITIONS

A. Conform to 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.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop.
   2. A/D Fire Protection Systems Inc: www.adfire.com.
   3. Hilti, Inc: www.us.hilti.com.
   4. Substitutions: See Section 01 2500 - Substitution Procedures.

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. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

E. Fire Ratings: Refer to drawings for required systems and ratings.

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.

C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.4 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

A. Gypsum Board Walls:

1. Wall to Wall Joints That Have Movement Capabilities (Dynamic):
   a. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
   b. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
2. Top of Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
   a. 2 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   b. 2 Hour Construction: UL System HW-D-0184; Hilti CP 606 Flexible Firestop Sealant.
   c. 1 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray and CP 672.

2.5 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 1 & 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 1 & 2 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   3. Electrical Cables Not In Conduit:
      a. 1 & 2 Hour Construction: UL System W-J-3199; Hilti CFS-SL SK Firestop Sleeve Kit.
   4. Insulated Pipes:
      a. 1 & 2 Hour Construction: UL System C-AJ-5313; Specified Technologies Inc. LC Endothermic Firestop Sealant.
   5. HVAC Ducts, Uninsulated:
      a. 1 & 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE MAX Intumescent Firestop Sealant.

B. Penetrations Through Floors By:
   1. Multiple Penetrations in Large Openings:
      a. 1 & 2 Hour Construction: UL System F-A-8012; Hilti CFS-S SIL GG Firestop Silicone Sealant Gun-Grade or CFS-S SIL SL Firestop Silicone Sealant Self-Leveling.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 1 & 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
   3. Insulated Pipes:
      a. 2 Hour Construction: UL System F-A-5015; Hilti CP 680-P/M Cast-In Device.

C. Penetrations Through Walls By:
   1. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Electrical Cables Not In Conduit:
      a. 2 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   3. Insulated Pipes:
      a. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 1 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.

4. HVAC Ducts, Uninsulated:
   a. 1 & 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE MAX Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 1 & 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.6 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

2.7 MATERIALS

A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
   1. Manufacturers:
      a. 3M Fire Protection Products: www.3m.com/firestop.
   2. Safing Insulation:
      a. Thermafiber Curtain wall Type SAF. Owens Corning www.themafiber.com.
      b. Thickness: 4".
      c. Density. 4 pcf.
   3. Substitutions: 01 2500 - Substitution Procedures

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

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 Brewster Central School District's Independent Testing Agency.

C. Do not cover installed firestopping until inspected by authorities having jurisdiction.

D. Install labeling required by code.

3.4 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Brewster Central School District, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.5 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.6 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. 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 8400 - Firestopping: Firestopping sealants.

C. Section 08 8000 - Glazing: Glazing sealants and accessories.

D. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.4 REFERENCE STANDARDS

A. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

C. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).

F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 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. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

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.

1.7 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.

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. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

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/#sle.
   3. Sika Corporation: www.usa-sika.com.
   4. W.R. Meadows, Inc: www.wrmeadows.com/sle.

B. Self-Leveling Sealants:
   1. Pecora Corporation; _____: www.pecora.com/#sle.
   2. Sika Corporation; _____: www.usa.sika.com/#sle.
   3. W. R. Meadows, Inc; _____: www.wrmeadows.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

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, the following items.
      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. Other joints indicated below.

3. Do not seal the following types of joints.
a. Intentional weepholes in masonry.
b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
d. Joints where installation of sealant is specified in another section.
e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
1. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
1. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.

2.3 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 6116.

2.4 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus ____ percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.

B. 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. Use for all perimeter joints of toilet fixtures, cabinets, casework, countertops and similar locations..
3. Manufacturers:
a. 786 Mildew Resistant; Dow Corning.
b. Pecora Corporation; 898 Silicone Sanitary Sealant: www.pecora.com.
c. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
d. Sanitary 1700; GE Silicones..
4. Substitutions: 01 2500 - Substitution Procedures

C. 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 standard range.
3. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
4. Manufacturers:
a. Pecora Corporation; Dynatrol I;: www.pecora.com.
b. Sika Corporation; Sikaflex-1a: www.usa.sika.com/#sle.
5. Applications: Use for:

a. Control, expansion, and soft joints in masonry.
b. Joints between concrete and other materials.
c. Joints between metal frames and other materials.
d. Other exterior joints for which no other sealant is indicated.

6. Substitutions: 01 2500 - Substitution Procedures

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade - Minus 18 Degrees C.
3. Manufacturers:
a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: www.pecora.com.
b. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant: www.stifirestop.com/#sle.
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 Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Manufacturers:
a. Sika Corporation; Sikaflex-1c SL: www.usa.sika.com/#sle.

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 (Vertical Joints): ASTM C1330; Type O - Open Cell Polyurethane.
2. Type for Joints Subject to Pedestrian or Vehicular Traffic (Horizontal Joints): Type C - Closed Cell PolyethyleneASTM C1330.
3. Open Cell: 40 to 50 percent larger in diameter than joint width.
4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

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.

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.

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 other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Ceiling expansion joint cover assemblies.

B. Fire-rated expansion joint cover assemblies.

C. Exterior wall expansion joint assembly.

D. Expansion joint assemblies for floor and other surfaces indicated.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Placement of joint cover assembly frames in masonry.

B. ITS (DIR) - Directory of Listed Products; current edition.

C. Section 07 9200 - Joint Sealants: Sealing expansion and control joints using gunnable and pourable sealants.

D. UL (DIR) - Online Certifications Directory; Current Edition.

E. Section 09 2116 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.

1.4 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2010.

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.
   2. MM Systems Corp: www.mmsystemscorp.com.
   3. Substitutions: 01 2500 - Substitution Procedures

2.2 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Non-Fire-Rated Wall/Ceiling Joints Subject to Seismic Movement:
   1. Products:
      a. The C/S Group FCFC-100 Wall to Ceiling
      b. The C/S Group FWFC-100 Corner.

c. The C/S Group GFST-100 Floor to Floor.
d. The C/S Group GFSTW-100 Floor to Wall.
e. The C/S Group FWF-100 Wall to Wall.
f. Substitutions: 01 2500 - Substitution Procedures

B. Interior Fire-Rated Wall/Ceiling Joints Subject to Seismic Movement:
1. Manufacturers:
a. C/S Group, ASMC-100 w/FB.
b. Substitutions: 01 2500 - Substitution Procedures

C. Exterior Wall Joints Subject to Thermal Movement:
1. Manufacturers:
a. The C/S Group VF-100 Wall to Wall.
b. Substitutions: 01 2500 - Substitution Procedures

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.

C. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.

2.4 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
1. Exposed Finish at Floors: Mill finish or natural anodized.
2. Exposed Finish at Walls and Ceilings: Natural anodized.

B. Resilient Seals:
1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
2. For Pedestrian Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.

C. Anchors and Fasteners: As recommended by cover manufacturer.

D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

E. Joint Covers: Aluminum cover plate, aluminum frame construction, retainers with resilient elastomeric filler strip, designed to permit plus or minus 50 percent joint movement with full recovery, flush mounted.

F. Back paint components in contact with cementitious materials.

G. Provide joint components in single length wherever practical. Minimize site splicing.

2.5 FINISHES

A. Resilient Filler Exposed to View: Gray.

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. Do not permit traffic over unprotected floor joint surfaces.

B. 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. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Accessories, including glazing, louvers, and matching panels.

1.3 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9123 - Interior Painting: Field painting.

1.4 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; 2019.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

F. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames; 2016.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

H. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

I. UL (DIR) - Online Certifications Directory; Current Edition.

J. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

K. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.5 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 inch by 2 inch in size (50 mm by 50 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.

G. Manufacturer's Qualification Statement.

1.6 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.

1.7 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; Product L-Series: GrainTech laminated full flush design door: www.allegion.com/us.
   2. Assa Abloy Ceco: www.assaabloydss.com.
   3. Substitutions: See Section 01 2500 Substitution Procedures.

2.2 DESIGN CRITERIA

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: Embossed with wood grain.
   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: Completely factory finished.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. 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 STEEL DOORS NON EMBOSSED

A. Interior Doors, Non-Fire Rated:

1. Grade: ANSI A250.8 (16 gauge) Level 3, physical performance Level A, Model 2, seamless, continuous welded.
2. Core Material: Kraftpaper honeycomb.
   a. STC Rating: 25
3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
4. Door Face Sheets: Flush.
5. Door Finish: Factory primed and field finished.

B. Interior Fire-Rated Doors:
1. Grade: ANSI A250.8 (16 gauge)Level 3, physical performance Level A, Model 2, seamless continuous welded.
2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   a. Temperature-Rise Rating (TRR) Across Door Thickness: 250 degrees F (121 degrees C).
   b. Provide units listed and labeled by UL (DIR).
   c. Attach fire rating label to each fire rated unit.
3. Door Core Material: Mineral board.
4. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
5. Door Face Sheets: Flush.
6. Door Finish: Factory primed and field finished.

2.4 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.

2.5 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. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
2. Frame Finish: Factory primed and field finished.

D. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
3. Frame Finish: Factory primed and field finished.

E. Transom Bars: Fixed, of profile same as jamb and head.

2.6 ACCESSORIES

A. Transoms: Same material, rating and finish as doors.

B. Glazing Trim: As per manufacturer's standard for embossed doors and glass thickness.

C. Glazing: As specified in Section 08 8000, factory installed.

D. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

E. Astragals for Double Doors: Specified in Section 08 7100.

F. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

G. 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.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

I. Frame Anchors: Minimum of six wall anchors and two base anchors.
1. T anchors for masonry.
2. Clips angles for metal framing.

J. 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".

K. Foam 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.

2.7 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Factory Finish: Wood grain embossed complying with ANSI A 250.3, manufacturer's standard coating.
1. Color: As selected by Architect from manufacturer's standard range.

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. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 08 7100.

E. Comply with glazing installation requirements of Section 08 8000.

F. 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.

G. Touch up damaged factory finishes.

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.

END OF SECTION

SECTION 08 1116
ALUMINUM 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. Aluminum Frames for Aluminum doors.

B. Monumental Aluminum Stile and Rail Doors.

C. Factory installed Finish Hardware

D. Foam door seal.

1.3 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing.

1.4 REFERENCE STANDARDS

A. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

B. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

D. ASTM-C518 – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.

E. ASTM D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

G. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

H. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2016.

I. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor; 2013a.

J. ASTM-D6670 – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

L. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

N. ASTM E1886 - – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials

O. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).

P. ASTM-F1642-04 – Standard Test Method for Glazing Systems Subject to Air Blast Loading

Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

R. NFRC 100 – Procedure for Determining Fenestration Products U-Factors.

S. NFRC 400 – Procedure for Determining Fenestration Products Air Leakage.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard details, installation instructions, hardware, anchor recommendations and applicable test reports.

C. Shop Drawings: Indicate layout and profiles; include assembly methods.
   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

D. Samples: Submit manufacturer’s door sample composed of door face sheet, core, framing and finish.
   1. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.

E. 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.

F. Test Reports: Submit certified test reports from qualified independent testing agency certifying doors and frames comply with specified performance requirements.

G. Manufacturer's Qualification Statement.

H. Operation and Maintenance Manual.
   1. Submit manufacturer’s maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.

I. 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.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than twenty (20) years of documented experience.
   1. Door and frame components from same manufacturer.
   2. Evidence of a compliant documented quality management system.
   3. Submit list of successfully completed projects including project name, location, name of Owner’s Representative and Architect, type, and quantity of doors manufactured.

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 and submit written report.

1.8 DELIVERY, STORAGE, AND HANDLING

A. 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.
   1. Labels clearly identifying opening, door mark, and manufacturer.

B. Store materials in original corrugated packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
   1. 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.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. 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.

C. Warranty Time Period: Ten Years from substantial completion.

D. Limited lifetime
   1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.

E. Finish:
   1. Kynar painted aluminum: 10 years.
   2. Anodized, aluminum:10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
   1. Aluminum Wide Stile Doors and frames
      a. Special-Lite, Inc. PO Box 6, Decatur, Michigan 49045.
         a) Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.
         b) Web Site www.special-lite.com <http://www.special-lite.com>.
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 DESCRIPTION

A. Model.
   1. SL-15 Wide Stile Monumental Door:

B. Door Opening Size:
   1. Refer to Door Schedule.

C. Construction.
1. Door Thickness:
   a. 1-3/4".
2. Stiles:
   a. 4-3/4" wide with integral glass stop on exterior side, no snap or applied stops allowed.
   b. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.
   c. Screw or snap in place applied caps are not acceptable.
   d. Meeting stiles to include integral pocket to accept pile brush weather seal.
3. Rails.
   a. Top Rail Height: 6-1/2"
   b. Bottom Rail Height: 10-1/2"
   c. Integral panel stops on exterior side, no snap or applied stops allowed.
   d. Aluminum Extrusions: 6063 aluminum alloys, temper of T5.
   e. Screw or snap in place applied caps are not acceptable.
4. Corners:
   a. True mortise and tenon joints.
   b. Secured with 3/8" diameter full-width steel tie rod.
   c. Weld, glue, or other methods of corner joinery are not acceptable.
5. Mid Panel.
   a. Model SL-484.
   b. 12" high.
   c. 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) 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) 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.
   d. Face Sheet:
      a) Exterior.
         (a) Aluminum
            (1) 0.125" thick smooth aluminum sheet.
      b) Interior.
         (a) Aluminum
         (b) 0.125" thick smooth aluminum sheet.
6. Hardware.
   a. Refer to Section 08 7100 - Door Hardware.
   b. Pre-machine doors in accordance with templates from specified hardware manufacturers.
   c. Surface mounted closures will be reinforced for but not prepped or installed at factory.
   d. Factory install door hardware.

7. Reinforcements.
    a. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
    b. Sheet and plate to conform to ASTM-B209.
    c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
    d. Bars and tubes to meet ASTM-B221.

2.3 FRAMING

A. Thermally Broken Aluminum Framing.
1. Model: SL600TB 2" x 6"
2. Materials.
    a. Aluminum extrusions made 6061 or 6063 aluminum alloys.
3. Perimeter Frame Members.
    a. Storefront frame with thermally broken pocket filler.
    b. Factory fabricated.
    c. Open-back framing is not acceptable.
4. Applied Door Stops.
    a. 5/8” x 1-1/4” or 5/8” x 1-3/4”, 0.125” wall thickness, with screws and weather-stripping.
    b. Provide solid ½” aluminum bar behind door stop for closer shoe attachment.
    c. Pressure gasketing for weathering seal.
    d. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
    e. Minimum ½” aluminum bar reinforcement under doorstop for required hardware attachments, aluminum to meet ASTM-B221.
5. Caulking.
    a. Caulk joints before assembling frame members.
6. Frame Member to Member Connections.
    a. Secure joints with fasteners.
    b. Provide hairline butt joint appearance.
    c. Shear block construction only, no screw spline allowed.
7. Hardware
    a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
    b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
    c. Factory install door hardware.
8. 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.

B. Capping.
1. Model.
    a. SL-70
2. Extruded Capping: With insert frame as indicated on the Drawings.
3. Finish: Match framing

2.4 PERFORMANCE

A. Door Panel.
1. Thermal Transmittance, AAMA 1503-98: U-Factor = 0.82 Btu/hr ft² °F, CRFp = 23.

B. Door and Thermally Broken Aluminum Frame Assembly.
   1. Thermal Transmittance, NFRC 100.
      a. Commercially Glazed Swinging Entrance Door (> than 50% glass)
         a) U-Factor = 0.62 Btu/hr ft² °F.
   2. 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.
   3. Sound Transmission, ASTM-E90: STC = 30, OITC = 28

2.5 MATERIALS

A. Aluminum Members.
   1. Aluminum extrusions made 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.

B. Fasteners.
   1. 410 stainless steel or other non-corrosive metal.

2.6 ARCHITECTURAL PANELS

A. Face Sheet.
   1. Aluminum
      a. Standard 0.062” thick smooth aluminum sheet.
   2. 1” Thick Panel.
      a. Polyurethane foam core.
      b. Thermal Performance, AAMA 1503-98.
      c. U-Factor = 0.23 Btu/hr ft² °F.
      d. CRFp = 81.
   3. Finish: Match door.

2.7 FINISH HARDWARE:

A. Provide and factory install finish hardware for each door leaf as specified in Section 08 8711 - Finish Hardware.
   1. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.

B. Pull
   1. Special-Lite SL-82 Clear Anodized Class I Aluminum Recessed Pull Handles.

C. Special-Lite SL-301 Concealed adjustable brush. Install door manufacturer’s multi-directional adjustable bottom with double nylon brush weatherstripping. Door bottom must be concealed and adjust to accommodate irregular tapered floor conditions.

D. Receive Hardware supplied in accordance with this Section, and coordinate with the Hardware requirements of this section. Report discrepancies (in writing) to the Architect immediately.

E. 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.

F. Install all Hardware, except surface mounted closers, holders, gaskets and seals 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.

G. Painting: All existing surfaces to remain exposed, and all disturbed areas shall be painted to match existing surfaces.

2.8 FABRICATION:

A. Factory Assembly:
   1. Sizes and Profiles: The required sizes for door and frame units, and profiles requirements are shown on the drawings.
   2. 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.
   3. 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.
   4. Assembly
      a. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to the cleaning, finishing, treatment and application for coatings.
      b. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64"
   5. No Welding of joints will be accepted.
   6. Conceal fasteners, wherever possible, except as otherwise noted.
   7. 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.
   8. 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.

B. Shop Fabrication
   1. All shop fabrication to be completed in accordance with manufactures process work instructions.
   2. Quality control to be performed before leaving each department.

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. Vision Lites.
   1. Factory Glazing.
   2. Glazing Thickness: 1". .

C. Rectangular Vision Lite Accessories.
   1. Security Grate.
      a. SL-SG349.
   2. Frame perimeter is 1” x 1” x 1/8” steel angle.
      a. Grate material is 14-gauge steel sheet perforated with ¼” diameter round holes.
      b. Vandal Screen.
      c. SL-SG350.

D. Glazing: As specified in Section 08 8000.

E. Hardware: As specified in Section 08 7100.

2.10 FINISHES

A. High Performance Organic Finish: AAMA 2604; multiple coats, thermally cured fluoropolymer system; color as selected from manufacturer's standard colors and premium colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive doors.

B. Notify Construction Manager of conditions that would adversely affect installation or subsequent use.

C. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.

D. Do not begin installation until substrates have been properly prepared.

E. If substrate preparation is the responsibility of another installer, notify Construction Manager of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Ensure openings to receive frames are plumb, level, square, and in tolerance.

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 fire-rated assemblies in accordance with NFPA 80.

C. Install exterior doors in accordance with ASTM E2112.

1. Install exterior doors to be weathertight in closed position.

D. Install door hardware as specified in Section 08 7100.

E. Install gaskets and seals to doors in accordance with manufacturer's instructions.

F. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate Aluminum, and other corrodible metal surfaces, from sources of corrosion or electrolytic action at points of contact with other materials, with bituminous coatings, or other means as approved by Architect and Construction Manager.

G. In masonry walls, install frames prior to laying masonry; anchor frames into masonry mortar joints; fill jambs with grout as walls are laid up.

H. In stud walls, install frames prior to building walls; anchor frames to studs using concealed anchors.

I. Set saddles in a bed of compound.

J. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

K. 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.

L. Repair or replace damaged installed products.

M. Remove and replace damaged components that cannot be successfully repaired as determined by Architect and Construction Manager.

3.4 FIELD QUALITY CONTROL

A. Manufacture's Field Services.
   1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.5 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.

3.6 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.

3.7 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 SECTION INCLUDES

A. Wall and ceiling access door and frame units.

1.2 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Field paint finish.

B. Division 22 & 23: Mechanical components requiring access.

C. Division 26: Electrical components requiring access.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

C. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 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. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Record actual locations of each access unit.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.1 WALL AND CEILING MOUNTED UNITS

A. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Material: Stainless steel.
2. Style: Exposed frame with door surface flush with frame surface.
   a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
3. Door Style: Single thickness with rolled or turned in edges.
4. Frames: 16 gage, 0.0598 inch (1.52 mm), minimum thickness.
5. Double-Skinned Hollow Steel Sheet Door Panels: 16 gage, 0.059 inch (1.52 mm), minimum thickness, on both sides and along each edge.
6. Stainless Steel Finish: No. 4 brushed finish.
7. Hardware:
   a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

b. Latch/Lock: Tamperproof tool-operated cam latch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 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 3313
COILING COUNTER DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire-rated coiling counter doors and operating hardware.

B. Electric motor operation; wiring from electric circuit disconnect to operator to control station.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 09 9123 - Interior Painting: Field paint finish.

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. ITS (DIR) - Directory of Listed Products; current edition.

C. NEMA MG 1 - Motors and Generators; 2018.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

E. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

E. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

F. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

1.5 QUALITY ASSURANCE

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for counterbalance shaft assembly. Complete forms in Brewster Central School District's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Coiling Counter Fire Doors:

Cornell: 24 Elmwood Avenue, Mountain Top, PA 18707.
Telephone: (800) 233-8366.
.Model: ERC 11 (w/ smoke shields)

Substitutions: See Section 01 6000 - Product Requirements.

2.2 COILING COUNTER DOORS

A. Coiling Counter Doors, Fire-Rated: Painted slat curtain.
   1. Mounting: Between jambs, within prepared opening.
   2. Provide integral frame and sill of same material and finish.
   3. Fire Rating: 90 minutes at Fire Wall and 45 minutes at Secure Vestibule.; comply with NFPA 80.
      a. Provide product listed and labeled by ITS (DIR) or UL (DIR) as suitable for the purpose specified and indicated.
   4. Nominal Slat Size: 1-1/4 inches (32 mm) wide.
   5. Slat Profile: Flat.
   6. Finish, Galvanized Steel: Factory baked enamel.
   7. Color: Tan.
   8. Guides: Formed track; same material and finish unless otherwise indicated.
   9. Hood Enclosure: Manufacturer's standard; primed steel.
   10. Fire Release Mechanism: Motorized door release device, actuated by local fire alarm system.
   11. Manual hand chain lift operation.

2.3 MATERIALS

A. Curtain Construction: Interlocking, single thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 16 gauge, 0.06 inch (1.5 mm).

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

D. Lock Hardware:
   1. Latching Mechanism: Inside mounted, adjustable keeper, spring activated latch bar feature to keep in locked or retracted position.
   2. Latch Handle: Manufacturer's standard.

E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

F. Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install fire-rated doors in accordance with NFPA 80.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Complete wiring from fire alarm system .

3.3 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).

C. Maximum Variation From Level: 1/16 inch (1.5 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

3.4 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

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. Aluminum-framed storefront, with vision glass.

B. Fire rated Aluminum framed storefronts

C. Internal metal reinforcement.

D. Infill panels of glass

E. Aluminum doors and frames.

F. Weatherstripping.

G. Foam framing seal.

H. Connections to building structure, metal framing and gypsum board, anchors, shims, fasteners, inserts, accessories, and support brackets.

1.3 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Firesafing

B. Section 07 8400 - Firestopping: Firestop at system junction with structure.

C. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

D. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

E. Section 08 8000 - Glazing: Glass, Fire rated Glass and glazing accessories.

F. Section 09 9123 - Interior Painting: .

1.4 REFERENCE STANDARDS

A. Aluminum Association (AA)

1. Aluminum Construction Manual
2. Specifications for Aluminum Structures

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

C. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

D. AAMA 503-92 Voluntary Specification for Field Testing of Metal Storefronts, Curtain Wall and Sloped Glazing Systems

E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

G. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

J. ASTM C 509 Specification for cellular Elastomeric Preformed Gasket and Sealing

K. ASTM C 864 Specification for Dense Elastomeric Compression Seal Gasket and Material

L. ASTM D 2240 Standard Test Method for Rubber Property - Durometer Hardness.

M. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2010).

N. ASTM E 774 Specification for Sealed Insulating Glass

O. AISC American Institute for Steel Construction Manual of Steel Construction

P. ANSI Z 97.1 Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test

Q. DWS 1.1 Structural Welding Code

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples, 12"x12" in size illustrating finished aluminum surface, glass infill panels,, glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations and anchorage..

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Designer's qualification statement.

J. Manufacturer's qualification statement.

K. Installer's qualification statement.

L. Specimen warranty.

M. 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

N. 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 necessarily be limited to, the engineering analysis of a particular manufacturer of all individual and aggregate components, fastening devices, connections, and embeds of work of this section.
2. Calculations shall be strictly coordinated with referenced to and submitted concurrently with shop drawings

O. Warranty: Submit manufacturer warranty and ensure forms have been completed in Brewster Central School District's name and registered with manufacturer.

P. Warranty Period: Manufacturer's and installers shall provide Two (2) years from Date of Substantial Completion of the project.

1.7 QUALITY ASSURANCE

A. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of New York.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.8 PRE-INSTALLATION MEETING

A. Conduct pre installation meeting one week prior to installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.10 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.11 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 for aluminum doors.

C. Correct defective Work within a ten year period after Date of Substantial Completion.

D. Provide 10 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

E. Provide 10 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

F. Provide 25 year manufacturer warranty of exterior finish.

G. 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.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Aluminum-Framed Storefront and Doors: (NON - FIRE RATED LOCATIONS)
   1. Kawneer of North America
   2. Exterior wall location. Basis of Design:
   3. Trifab® 451UT Framing System:
      a. 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension
      b. Thermal
      c. Center Plane
      d. Screw Spline Fabrication

B. Fire rated Aluminum Storefront System:
   1. SAFTIFIRST Safety and Fire Technology Inc.
      www.safti.com 888.653.3333

SuperLite II-XL 45 IGU glass per indicated rating

2. Interior Vestibule location, Basis of Design:
   a. GPX Architectural Series, 45 Minute Fire Resistive GPX openings
   b. 2-1/2" x 4-1/2" frame
   c. GPX Builder Series fire protective doors, and transoms, 45 minute rated
   d. Glass, Super lite 11-XL 45 IGU

C. Substitutions: See Section 01 2500 - Substitution Procedures.

2.2 COMPONENTS

A. INTERIOR VESTIBULE SYSTEM AND EXTERIOR WINDOWS WHERE INDICATED ON THE DRAWINGS.
   1. 45 minute fire rated system: (See SAFTIFIRST above) Factory fabricated, factory finished aluminum framing members with glass infill, and related, anchorage and attachment devices.
      a. Framing Members: Tubular aluminum sections.
      b. Unitized, shop assembly.
      c. Glazing Rabbet: For 1 3/4" fire resistive safety glazing.
      d. Finish: High performance organic coatings.
         a) Factory finish all surfaces that will be exposed in completed assemblies.
      e. Finish Color: As selected by the Architect from the manufacturers standard and premium range of colors. Include all metallic colors. .
      f. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
      g. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
      h. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
      i. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   2. Performance Requirements

2.3 COMPONENTS

A. EXTERIOR WALL SYSTEM

B. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

C. Glazing Stops: Flush.
   1. Cross-Section: As indicated on drawings.

D. Glazing: See Section 08 8000 for additional glazing info.

E. Doors: Glazed aluminum
   1. Thickness: 1-3/4 inches (43 mm).
   2. Sizes: As indicated on drawings.
   3. Fire rating: as indicated on drawings.

F. Sound Transmission Class (STC): When tested to AAMA Specification 1801 and in accordance with ASTM E 1425, the STC Rating shall not be less than: Glass to Exterior - 38
   1. Doors: Air infiltration (Single Acting Butt Hinges: Air infiltration shall be tested in accordance with ASTM E 283-91 at static pressure of 1.57 PSF (75 Pa). Infiltration shall not exceed 0.00 CFM/FT (0.00 m3/h.m) of crack length

G.

2.4 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

E. Meeting stiles, on pairs of doors, are to have pile weather stripping in an adjustable astragal.

F. Fasteners: Stainless steel.

G. Perimeter Sealant: Type specified in Section 07 9200 - Joint Sealants.

2.5 FINISHES

A. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

B. High Performance Organic Coating: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

1. Manufacturers:

a. Sherwin-Williams Company; Powdura 4000: oem.sherwin-williams.com/#sle.

2.6 HARDWARE

A. Door Hardware: As specified in Section 08 7100.

2.7 FABRICATION

A. Fabricate components with minimum clearances and shim space around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.

C. General: Fabricate aluminum entrance and storefront components and swing doors to designs, sizes and thickness indicated and to comply with indicated standards. Sizes and profile requirements are indicted on the drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work.

D. Thermal-Break Construction: Fabricate storefront framing system with an internally concealed, low-conductible thermal barrier, located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact. Use manufacturer's standard construction that has been in use for similar projects for period of not less than 3 years.

E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a non-absorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. See Section 08 7100 for hardware installation requirements.

K. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 08 8000.

L. Install perimeter sealant in accordance with Section 07 9200 - Joint Sealants.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

C. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.

D. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.

E. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch

3.4 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 01 4000 - Quality Requirements for general testing and inspection requirements.

C. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.

1. Perform a minimum of two tests in each designated area as indicated on drawings.
2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

D. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf (75 Pa).

E. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.5 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.6 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. 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

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.7 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Protect finished work from damage.

END OF SECTION

SECTION 08 5659
SERVICE AND TELLER WINDOW UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Service and teller window units.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.3 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. ITS (DIR) - Directory of Listed Products; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

B. Preinstallation Meeting: Prior to start of installation arrange a meeting on site to familiarize installer and installers of related work with requirements relating to this work.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.

C. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.

D. Test Data: Test reports for specific window model and glazing to be furnished, showing compliance with all specified requirements; window and glazing may be tested separately, provided window test sample adequately simulates the glazing to be used.

E. Samples for Selection of Finishes:

1. Applied Finishes: Color charts for factory finishes.

F. Manufacturer Qualification Statement.

G. Installer Qualification Statement.

H. 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: Company specializing in manufacturing products specified in this section with at least ten years documented experience, and with ability to provide test reports showing that their standard manufactured products meet the specified requirements.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

B. Store units in area protected from exposure to weather and vandalism.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace units and their components that fail in materials or workmanship within five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Service and Teller Window Units:
   1. Quikserv: www.quikserv.com/#sle.
   2. Ready Access, Inc: www.ready-access.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SERVICE AND TELLER WINDOW UNITS

A. Location: Built within interior wall, as indicated on drawings.

B. Type of Use: As indicated on drawings.

C. Window Types: Sliding and vertical lift.
   1. Operation: Manual.
   2. Window Size: As indicated on drawings.
   3. Material: Aluminum.
      a. Finish Color: As selected from manufacturer's standard colors and premium colors.

D. Glazing at sliding window, vestibule location: 3/4-inch GE Lexgard MP-750 Laminate. 3-ply clear, extruded Lexan polycarbonate and acrylic laminate with Margard surface. Bullet-resistant security glazing, ASTM F 1233. UL 752, Level 1.

E. Glazing at vertical lift window: Tempered safety glazing.

F. Products:
   1. Ready-Access Inc.
      Ready@Ready-Access.com
      a. 600 Series Flush Mount Window

   2. Quikserv; _____
      a. SUI 1200 Manual, Vertical Lift window.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.3 ASSEMBLY COMPONENTS

A. Windows: Factory-fabricated, finished, and glazed, with extruded aluminum frame and glazing stops; complete with hardware and anchors.
   1. Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.
   2. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
   3. Apply factory finish to exposed surfaces.
   4. Wind Design: Design and size components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with applicable code.

2.4 MATERIALS

A. Aluminum Extrusions: Minimum 1/8 inch (3.2 mm) thick frame and sash material complying with ASTM B221 and ASTM B221M.
   1. Finish: Tiger drylac series, powder coat.

2.5 FINISHES

A. Color: To be selected by Architect from manufacturer's full range of standard and premium colors.

2.6 ACCESSORIES

A. Hardware and Security Devices for Sliding Windows:
   1. Auto-Lock Handle: Stainless steel auto-locking handle on all self-closing sliders to prevent intrusion.
   2. Standard hardware for vertical lift window, with locks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install units in correct orientation (inside/outside or secure/non-secure).

C. Anchor units securely in manner so as to achieve performance specified.

D. Separate metal members from concrete and masonry using bituminous paint or with products recommended in writing by the manufacturer for this purpose.

E. Remove and replace defective work.

3.3 ADJUSTING

A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

3.4 CLEANING

A. Remove protective material from factory finished surfaces.

B. Clean exposed surfaces promptly after installation without damaging finishes.

3.5 DEMONSTRATION

A. Train Brewster Central School District's maintenance personnel to adjust, operate, and maintain operable units.
   1. Instructor: Manufacturer's training personnel.
   2. Location: At project site.
   3. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.6 PROTECTION

A. Provide temporary protection to ensure that service and teller windows are without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for hollow metal, 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 080671 - Door Hardware Schedule: Schedule of door hardware sets.

C. Section 081113 - Hollow Metal 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: www.bestaccess.com
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: www.bestaccess.com
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.

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: www.bestaccess.com
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: www.bestaccess.com
2. Substitutions: Not permitted.
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: www.bestaccess.com/#sle.

2. Substitutions: Not permitted.
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.
   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 commercial, dormakaba Group: www.dormakaba.com/us-en
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: Plastic.
            (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: www.bestaccess.com
2. Substitutions: Not permitted.
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: 1020SL 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 SETS

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.	BE	BEST
2.	PR	Precision
3.	RC	RCI
4.	DM	Dormakaba
5.	NA	National Guard Products
6.	AB	ABH Manufacturing
7.	TR	Trimco

D. Hardware Sets

Set #100

Doors: 100

A.	Continuous Hinge		661HD SO	AL	BE	
B.	Storeroom Lockset		9K3-7D15D L/C S3B TL/O	626		BE
C.	SFIC	Owner Standard		626	BE	
D.	Closer	8916 SPA DA		689	DM	
E.	Overhead Stop	N1020SL Series		630	AB	
F.	Kick Plate	KO050 10" x 2" LDW x CSK B4E		630		TR
G.	Gasketing	161SA @ Head & Jambs			NA	
H.	Auto Door Bottom		320S		NA	
I.	Threshold	Per Detail	AL	NA		

Set #101

Doors: 200

A.	Continuous Hinge		661HD SO	AL	BE	
B.	Intruder Lockset	9K3-7IN15D L/C S3B		626	BE	
C.	SFIC	Owner Standard		626	BE	
D.	Closer	8916 SPA	689	DM		
E.	Overhead Stop	N1020SL Series		630	AB	
F.	Kick Plate	KO050 10" x 2" LDW x CSK B4E		630		TR
G.	Gasketing	161SA @ Head & Jambs			NA	
H.	Threshold	Per Detail	AL	NA		

Set #102

Doors: 201

A.	Continuous Hinge		661HD SO	AL	BE
B.	Exit Device	FL 2103 x C03 SNB		630	PR
C.	Rim Cylinder	12E-72 L/C	626	BE	
D.	SFIC	Owner Standard		626	BE
E.	Electric Strike	9500 x 2005M3 FSE		630	HS
F.	Closer	8916 S-DS SN		689	DM
G.	Seals	By Alum. Storefront Mfg.			
H.	Threshold	Per Detail	AL	NA	
I.	Key Switch	KS801 L1	628	DM	
J.	Mortise Cylinder	1E-74 L/C	626	BE	
K.	Remote Switch	By Security Provider			
L.	Position Switch	By Security Provider			
M.	Card Reader	By Security Provider			
N.	Junction Box	By Electrical			
O.	Wiring & Riser Diagrams		Coordinate w/ Related Trades		
P.	NOTE: Key switch or remote switch for momentary or maintain access as required.				
Q.	NOTE: Integrate power to electric strike through fire alarm.				
R.	NOTE: Card reader to release electric strike when door is locked.				
S.	NOTE: Coordinate all hardware as required for fire ratings.				
T.	NOTE: Coordinate additional requirements with electrical and security provider.				
U.	NOTE: Sequence unlocking with adjacent entrance door.				

Set #103

Doors: 206

A.	Continuous Hinge		661HD SO	AL	BE
B.	Exit Device	2103 x C03 SNB		630	PR
C.	Rim Cylinder	12E-72 L/C	626	BE	
D.	SFIC	Owner Standard		626	BE
E.	Electric Strike	9500 x 2005M3		630	HS
F.	Closer	8916 SPA SN	689	DM	
G.	Overhead Stop	N1020SL Series		US32D	AB
H.	Seals	By Alum. Storefront Mfg.			
I.	Door Sweep	C697A		NA	
J.	Threshold	Per Detail	AL	NA	
K.	Position Switch	By Security Provider		BLK	RC
L.	Card Reader	By Security Provider			
M.	Junction Box	By Electrical			
N.	Wiring & Riser Diagrams		Coordinate w/ Related Trades		

O. NOTE: Card reader to release electric strike when door is locked.

P. NOTE: Coordinate additional requirements with electrical and security provider.

Q. NOTE: Sequence unlocking with adjacent vestibule door.

Set #104

Doors: 202

A.	Continuous Hinge	661HD SO	AL	BE	
B.	Removable Mullion	KR FL 822 MCS KMC	689	PR	
C.	Exit Device	FL 2102 CD SNB	630	PR	
D.	Exit Device	FL 2102 CD SNB	630	PR	
E.	Rim Cylinder	12E-72 L/C 626	BE		
F.	SFIC	Owner Standard	626	BE	
G.	Closer	8916 SPA SN689	DM		
H.	Overhead Stop	N1020SL Series	US32D	AB	
I.	Mullion Seal	5100 N	NA		
J.	Seals	By Alum. Storefront Mfg. (verify)			
K.	Threshold	Per Detail AL	NA		
L.	Mortise Cylinder	1E-74 L/C 626	BE		
M.	Position Switch	By Security Provider	BLK	RC	

N. NOTE: Coordinate additional requirements with electrical and security provider.

O. NOTE: Coordinate all hardware as required for fire ratings.

Set #105

Doors: 205

A.	Continuous Hinge	661HD SO	AL	BE	
B.	Removable Mullion	KR822 MCS KMC	689	PR	
C.	Exit Device	2102 CD SNB	630	PR	
D.	Exit Device	2102 CD SNB	630	PR	
E.	Rim Cylinder	12E-72 L/C 626	BE		
F.	SFIC	Owner Standard	626	BE	
G.	Closer	8916 SPA SN689	DM		
H.	Overhead Stop	N1020SL Series	US32D	AB	
I.	Mullion Seal	5100 N	NA		
J.	Seals	By Alum. Storefront Mfg.			
K.	Door Sweep	C697A	NA		
L.	Threshold	Per Detail AL	NA		
M.	Position Switch	By Security Provider	BLK	RC	

N. NOTE: Coordinate additional requirements with electrical and security provider.

Set #106

Doors: 204

A.	Continuous Hinge	661HD SO	AL	BE	

B.	Mullion	822 MCS	689	PR	
C.	Exit Device	2102 CD SNB		630	PR
D.	Exit Device	2102 CD x C03 SNB		630	PR
E.	Rim Cylinder	12E-72 L/C	626	BE	
F.	SFIC	Owner Standard		626	BE
G.	Electric Strike	9500 x 2005M3		630	HS
H.	Closer	8916 SPA SN	689	DM	
I.	Overhead Stop	N1020SL Series		US32D	AB
J.	Mullion Seal	5100 S (as required)			NA
K.	Seals	By Alum. Storefront Mfg.			
L.	Door Sweep	C697A		NA	
M.	Threshold	Per Detail	AL	NA	
N.	Position Switch	By Security Provider		BLK	RC
O.	Card Reader	By Security Provider			
P.	Junction Box	By Electrical			
Q.	Wiring & Riser Diagrams	Coordinate w/ Related Trades			
R.	NOTE: Card reader to release electric strike when door is locked.				
S.	NOTE: Coordinate additional requirements with electrical and security provider.				

Set #107

Doors: 203

A.	Continuous Hinge		661HD SO	AL	BE
B.	Mullion	FL 822 MCS			
C.	Exit Device	FL 2102 CD SNB		630	PR
D.	Exit Device	FL 2102 CD x C03 SNB		630	PR
E.	Rim Cylinder	12E-72 L/C	626	BE	
F.	SFIC	Owner Standard		626	BE
G.	Electric Strike	9500 x 2005M3 FSE		630	HS
H.	Closer	8916 S-DS SN		689	DM
I.	Mullion Seal	5100 N (as required)			NA
J.	Seals	By Alum. Storefront Mfg.			
K.	Threshold	Per Detail	AL	NA	
L.	Position Switch	By Security Provider		BLK	RC
M.	Junction Box	By Electrical			
N.	Wiring & Riser Diagrams	Coordinate w/ Related Trades			
O.	NOTE: Card reader to release electric strike when door is locked.				
P.	NOTE: Coordinate additional requirements with electrical and security provider.				
Q.	NOTE: Integrate power to electric strike through fire alarm.				
R.	NOTE: Coordinate all hardware as required for fire ratings.				

END OF SECTION

SECTION 08 7110
FINISH HARDWARE

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. Section includes:
   1. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:
   1. Windows
   2. Cabinets (casework), including locks in cabinets
   3. Signage
   4. Toilet accessories
   5. Overhead doors

1.3 RELATED SECTIONS:

A. Section 07 9200 - Joint Sealants for sealant requirements applicable to threshold installation specified in this section.

1.4 REFERENCES

A. Fire/Life Safety
   1. NFPA - National Fire Protection Association
      a. NFPA 70 – National Electric Code
      b. NFPA 80 - Standard for Fire Doors and Fire Windows
      c. NFPA 101 - Life Safety Code
      d. NFPA 105 - Smoke and Draft Control Door Assemblies
      e. New York State Fire Safety Code.

B. UL - Underwriters Laboratories
   1. UL 10B - Fire Test of Door Assemblies
   2. UL 10C - Positive Pressure Test of Fire Door Assemblies
   3. UL 1784 - Air Leakage Tests of Door Assemblies
   4. UL 305 - Panic Hardware

C. Accessibility
   1. ADA - Americans with Disabilities Act.
   2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

D. DHI - Door and Hardware Institute
   1. Sequence and Format for the Hardware Schedule
   2. Recommended Locations for Builders Hardware
   3. Key Systems and Nomenclature

E. ANSI - American National Standards Institute
   1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.5 SUBMITTALS

A. General:
   1. Submit in accordance with Conditions of Contract and Division 01 requirements.

2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.

B. Action Submittals:
1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      a) Details of interface of electrified door hardware and building safety and security systems.
      b) Schematic diagram of systems that interface with electrified door hardware.
      c) Point-to-point wiring.
      d) Risers.
   b. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
      a) Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
   c. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
      a) Door Index; include door number, heading number, and Architects hardware set number.
      b) Opening Lock Function Spreadsheet: List locking device and function for each opening.
      c) Type, style, function, size, and finish of each hardware item.
      d) Name and manufacturer of each item.
      e) Fastenings and other pertinent information.
      f) Location of each hardware set cross-referenced to indications on Drawings.
      g) Explanation of all abbreviations, symbols, and codes contained in schedule.
      h) Mounting locations for hardware.
      i) Door and frame sizes and materials.
      j) Name and phone number for local manufacturer's representative for each product.
      k) Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
         (a) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
   d. Key Schedule:

a) After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
b) Use ANSI A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
c) Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
d) Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
e) Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
(a) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
f) Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

e. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:
1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product Certificates for electrified door hardware, signed by manufacturer:
a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
b. Certificates of Compliance:
a) Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
c. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
d. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:
1. Operations and Maintenance Data : Provide in accordance with Section 01 7800 - Closeout Submittals and include:
a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Name, address, and phone number of local representative for each manufacturer.
d. Parts list for each product.
e. Final approved hardware schedule, edited to reflect conditions as-installed.
f. Final keying schedule
g. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
h. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.6 QUALITY ASSURANCE

A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.
1. Where specific manufacturer’s product is named and accompanied by make or model number or other designation, provide product specified. (Note: Certain products have been selected for their

unique characteristics and particular project suitability.) Locksets will be purchase under State contract and provided to Contractor for installation. Refer to Section 00 4440 Owner Supplied Contractor Installed.

a. Where no additional products or manufacturers are listed in product category, requirements for Section 01 6000 shall govern product selection.

b. Where products indicate “acceptable substitute” or “acceptable manufacturer”, provide product from specified manufacturers, subject to compliance with specified requirements and “Single Source Responsibility” requirements stated herein.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
    a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to Architect and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

H. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.

I. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
   2. Maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
      c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
      d. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
      e. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

J. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.
   1. Attendees: Owner, Contractor, Installer, and Supplier's Architectural Hardware Consultant.
   2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      b. Preliminary key system schematic diagram.
      c. Requirements for key control system.
      d. Requirements for access control.
      e. Address for delivery of keys.

K. Pre-installation Conference: Conduct conference at Project site.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Inspect and discuss preparatory work performed by other trades.
   3. Inspect and discuss electrical roughing-in for electrified door hardware.
   4. Review sequence of operation for each type of electrified door hardware.
   5. Review required testing, inspecting, and certifying procedures.

L. Coordination Conferences:
   1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
      a. Attendees: Door hardware Supplier/Installer, Contractor.
      b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.

M. Existing Conditions: Verify all existing conditions in the field to ensure compatibility with hardware specified in the Hardware Sets herein. Any discrepancies between the existing field conditions and hardware specified shall be brought to the attention of the Architect immediately. Hardware Supplier shall not order any hardware until all discrepancies are rectified and the Architect grants written approval.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
   1. Deliver each article of hardware in manufacturer's original packaging.

C. Project Conditions:
   1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
   2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:
   1. Promptly replace products damaged during shipping.
   2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
   3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys to Owner by registered mail or overnight package service.

1.8 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Section 28 1000 and Contractor's hardware consultant.

D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

E. Direct shipments not permitted, unless approved by Contractor.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
      a. Closers:
         a) Mechanical: 10 years.
      b. Locksets:
         a) Mechanical: 3 years.
      c. Continuous Hinges: Lifetime warranty.
      d. Key Blanks: Lifetime
   2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.10 MAINTENANCE

A. Maintenance Tools:
   1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Approval of manufacturers other than those listed shall be in accordance with QUALITY ASSURANCE article, herein.

B. Approval of products from manufacturers indicated as "Acceptable Manufacturer" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Scheduled Manufacturer

1.	Hinges	Ives (IVE)
2.	Continuous Hinges	Ives (IVE)
3.	Flush Bolt	Ives (IVE)
4.	Surface Bolts	Ives (IVE)
5.	Coordinators	Ives (IVE)
6.	Locksets & Deadlocks	Schlage (SCH); Best (BES)
7.	Cylinders & Keying	Schlage (SCH); Best (BES)
8.	Door Closers	LCN (LCN)
9.	Door Trim	Ives (IVE)
10.	Stops & Holders	Ives (IVE)
11.	Thresholds & Weatherstrip	Zero (ZER)
12.	Silencers	Ives (IVE)

D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 EXISTING MATERIALS

A. Where existing door hardware is indicated to be removed and reinstalled:
   1. Carefully remove door hardware and components.
   2. Clean, protect and store existing door hardware in accordance with storage and handling requirements specified herein.
   3. Reinstall in accordance with installation requirements for new door hardware.

2.3 MATERIALS

A. Fasteners
   1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
   2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
   3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
   4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.

1. Use materials which match materials of adjacent modified areas.
2. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.4 CONTINUOUS HINGES

A. Aluminum Geared

B. Manufacturers:
1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Markar, Stanley.

C. Requirements:
1. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 2.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Install hinges with fasteners supplied by manufacturer.
7. Provide hinges with symmetrical hole pattern.

2.5 FLUSH BOLTS

A. Manufacturers:
1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

B. Requirements:
1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.6 CYLINDRICAL LOCKS - GRADE 1

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product: Schlage ND Series
2. Acceptable Manufacturers and Products: Best 9k Series

B. Requirements:
1. Provide cylindrical locks conforming to the following standards and requirements:
   a. ANSI/BHMA A156.2 Series 4000, Grade 1.
   b. UL 10C for 4’-0” x 10’-0” 3-hour fire door.
   c. Florida Building Code (ASTM E330, E1886, E1996) and Miami Dade (TAS 201, 202, 203) requirements for hurricanes.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
   a. Abusive Locked Lever Torque Test - minimum 3,100 inch-pounds without gaining access

b. Cycle life - tested to minimum 10 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers.

4. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
5. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
8. Provide electrified options as scheduled in the hardware sets.
9. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
   a. Lever Design: Schlage Rhodes.
   b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.7 FINAL CYLINDERS AND KEYING

A. Final key system shall be small format interchangeable cores by Best, provided by Owner.

B. Coordinate a meeting with the owner to determine the key requirements for the building.

C. Final Cylinders to have the following;
   1. Core to have concealed key control stampings
   2. Final core to be installed by the owner's represented.
   3. Return all construction cores to the hardware supplier.
   4. Final biting list to be delivered to the owner no additional cost to the owner.

D. Keys shall have the following;
   1. Material: Nickel silver; minimum thickness of .092-inch (2.3mm)
   2. Keys to be stamped with visual key control.
   3. Key bow to have stamped "DO NOT DUPLICATE".
   4. Quantity: Furnish in the following quantities.
      a. Change (Day) Keys: 3 per cylinder/core.
      b. Final Control Keys: 3.
      c. Master Keys: 6

2.8 DOOR CLOSERS

A. Manufacturers:
   1. Scheduled Manufacturer: LCN 4010 and 4110 series.

B. Requirements:
   1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
   2. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder, and shall utilize full complement bearings at shaft. Cylinder body shall be 1-1/2 inch diameter, and double heat-treated pinion journal shall be 11/16 inch diameter.
   3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
   4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.

5. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within a 6-inch top rail without the use of a mounting plate so that closer shall not be visible through vision panel from pull side.
6. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
7. Closer cylinders, arms, adapter plates, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or shall have special rust inhibitor (SRI).
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
9. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

2.9 PROTECTION PLATES

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.

B. Requirements:
   1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
   2. Sizes of plates:
      a. Kick Plates: 8 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
      b. Mop Plates: 8 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.10 DOOR STOPS AND HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.

B. Provide door stops at each door leaf in accordance with the following requirements:
   1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
   2. Where a wall stop cannot be used, provide dome type floor stops for low or high rise options.
   3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.11 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturers: Glynn-Johnson

B. Requirements:
   1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
   2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
   3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
   4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.12 SMOKE SEALS GASKETING AND ASTRAGALS

A. Manufacturers:
   1. Scheduled Manufacturer: Zero.

B. Requirements:
   1. Provide gasketing smoke seals and astragals as specified. Match finish of other items as closely as possible.

2.13 SILENCERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.

B. Requirements:
   1. Provide "push-in" type silencers for hollow metal.
   2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.

2.14 FINSHES

A. A. Finish of all hardware shall be as specified within the hardware sets

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Where on-site modification of doors and frames is required prepare hardware locations in accordance with the following:
   1. Prepare hardware locations in accordance with:
      a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
      b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
      c. Where doors are in rated assemblies, comply with NFPA 80 for restrictions on on-site door hardware preparation.
         a) Where on-site modification of existing doors and frames is required:
         b) Remove existing hardware being replaced, tag, and store according to contract documents.
         c) Field modify and prepare existing door and/or frame for new hardware being installed.
         d) When modifications are exposed to view, use concealed fasteners, when possible.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.

3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Replace construction cores with permanent cores as indicated in keying section.
2. Coordinate with owner for direction of the installation of permanent.

I. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

J. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
1. Configuration: Provide [one power supply for each door opening][least number of power supplies required to adequately serve doors] with electrified door hardware.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

L. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

M. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

N. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

O. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

P. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. After installation has been completed, the hardware supplier and manufacturers representative for locksets, door closers, exit devices, and overhead stops shall check the project and verify compliance with installation instructions, adjustment of all hardware items, and proper application according to the approved hardware schedule. Provide a written report, with itemized confirmation, by hardware supplier listing all hardware that has not been installed correctly.

B. After installation has been completed, the hardware supplier and manufacturers representative shall meet with the owner to explain the functions, uses, adjustment, and maintenance of each item of hardware.

C. The contractor shall retain, at their cost, a qualified independent Architectural Hardware Consultant, duly certified by the Hardware Industry and approved by the Architect, prior to Substantial Completion, to inspect the installation ans certify that the and installation has been furnished and installed in accordance

with manufacturer's instructions and specified and is in proper working order. Consultant shall submit a written report.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three (3) months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to 01 7900 - Demonstration and Training.

3.8 DOOR HARDWARE SCHEDULE

A. Provide hardware for each door to comply with requirements of this section and the below-listed scheduled sets.

B. It is intended that the following schedule includes complete items of door hardware necessary to complete the work. If a discrepancy is found in the scheduled hardware sets, such as a missing item, improper hardware for a frame, door or fire codes, provisions of the above-specifications shall govern.

C. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

HARDWARE SETS:

HARDWARE GROUP NO. 01

Provide each SGL door(s) with the following:

Qty	Description	Catalog Number	Finish	Mfr
1 EA	CONT. HINGE	224HD	628	IVE
1 EA	CLASSROOM SECURITY	ND95BDCD RHO	626	SCH
2 EA	PERMANENT CORE	BY OWNER	626	
1 EA	OH STOP	90S	630	GLY
1 EA	SURFACE CLOSER	4011 DEL	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1 EA	GASKETING	8144S-BK	S-Bk	ZER

1	EA	THRESHOLD	655A-MSLA-10	A	ZER

Hardware Group No. 01A

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CLASSROOM SECURITY	ND95BDCD RHO	626	SCH
2	EA	PERMANENT CORE	BY OWNER	626	
1	EA	SURFACE CLOSER	4111 DEL EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	8144S-BK	S-Bk	ZER
1	EA	THRESHOLD	655A-MSLA-10	A	ZER

Hardware Group No. 01B

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CLASSROOM SECURITY	ND95BDCD RHO	626	SCH
2	EA	PERMANENT CORE	BY OWNER	626	
1	EA	SURFACE CLOSER	4111 DEL EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	SOUND SEAL	870	BP	ZER
		HEAD & JAMB			
1	EA	THRESHOLD	655A-MSLA-10	A	ZER

Hardware Group No. 02

Provide each SGL door(s) with the following:

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	ENTRANCE LOCK	ND95BDCD RHO	626	SCH
1	EA	PERMANENT CORE	BY OWNER	626	
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	THRESHOLD	655A-MSLA-10	A	ZER
3	EA	SILENCER	SR65	GRY	IVE

Hardware Group No. 03

Provide each PR door(s) with the following:

2	EA	CONT. HINGE	224HD	628	IVE

2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80BDCD 8RO RHO	626	SCH
1	EA	PERMANENT CORE	BY OWNER	626	
2	EA	OH STOP	90S	630	GLY
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	THRESHOLD	655A-MSLA-10	A	ZER
2	EA	SILENCER	SR64	GRY	IVE

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. High Performance Architectural Insulating glass units.

B. Glazing units.

C. Laminated safety glass.

D. Fire rated safety glass.

E. Insulated laminated glass

F. Security films.

G. Glazing compounds.

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 4313 - Aluminum-Framed Storefronts. Glazing installed in storefront.

D. Section 08 5659 - Service and Teller Window Units: Glazing provided as part of assembly.

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 (Reaffirmed 2020).

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; 2021a.

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 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.7 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.

J. 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 Insulating Glass Units: Two of each glass size and each glass type.

1.8 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 laminated 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.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

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.

1.9 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.

1.10 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.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.12 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. Security Glass: 10 year warranty against delamination and 10 year warranty against seal failure.

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 indicated on drawings
      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

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. 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.

2.5 GLASS TYPES

A. **High Performance Insulated Glazing (Exterior storefront, non rated)**
   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. Spandrel Glass: Clear + Solarban 60 (2) / Clear + OPACI-COAT-300 #4, where indicated.
   5. Use for all non fire rated exterior storefront applications.
   6. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

B. **High Performance Insulated Laminated Glazing: (All exterior doors and Interior partition W3.)**
   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. Use for exterior doors, transoms and sidelites and as indicated on drawings.
5. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

C. **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

2.6 SECURITY FILMS

A. Basis of Design: 3M Scotchshield Safety and Security Window Film
   1. Product: Ultra Prestige Series, Ultra PR S70

B. As located on the drawings.

C. Substitutions, see Section 01 6000.

2.7 GLAZING COMPOUNDS

A. As reccommended by the manufacturer.

2.8 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.

2.9 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

2.10 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 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 Framing - Nonstructural Members; 2015.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Amendment (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; 2017.

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 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.

1.3 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.
   1. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 1999 (Reaffirmed 2019).
   2. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).
   3. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2019).
   4. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017.
   5. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2019).
   6. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).
   7. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.
   8. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.
   9. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).
   10. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; 2020.
   11. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2021.

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; 2018.

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; 2021.

1.4 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. 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.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

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 Tile: 10 square feet (1 square meters) of each size, color, and surface finish combination.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.6 MOCK-UP

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 the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

PART 2 PRODUCTS

2.1 TILE

A. Manufacturers: All products by the same manufacturer.
   1. Prospec, LLD, Distributed byProspec, Steve Sicliano1-888-773-2845 ext 1.
   2. Substitutions: Section 01 2500 Substitution Procedures.

B. Floor Tile Ceramic Mosaic: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 12 by 12 inch (300 by 300 mm), nominal.
   3. Thickness: 3/8/"
   4. Edges: Square.
   5. Surface Finish: Varies, Matt and Roccia. See drawings for locations., Non-slip, to comply with or exceed DC of 0.42.
   6. Color(s): As indicated on drawings.
      Pattern: As indicated on drawings
   7. Trim Units: Matching bead, cove, and surface bullnose shapes in sizes coordinated with field tile.

2.2 ADHESIVE MATERIALS

A. Manufacturers:
   1. Mapei Corporation; Product Ultrflex LFT: www.mapei.com.
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.3 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.

2.4 PRIMER.

A. For use over existing tile.
   1. Mapei ECO Prim Grip primer.

2.5 GROUTS

A. Manufacturers:
   1. Mapei Corporation ; Product Mapei Ultracolor, Plus FA
   2. Substitutions: Section 01 2500 Substitution Procedures.

B. Standard Grout: Any type specified in ANSI A118.6 or A118.7.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor 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 sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor 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.

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. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive. Refer to TCNA (HB) EJ 171 for location and frequency of joints.

H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. 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.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over exterior concrete substrates, install in accordance with TCNA (HB) Method F102, with standard grout.

3.5 CLEANING

A. Clean tile and grout surfaces.

3.6 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.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 4000 - Cold-Formed Metal Framing.

C. Section 07 9200 - Joint Sealants: Acoustical sealant.

D. 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 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 12 x 12 inch (300 by 300 mm) in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 12 inches (300 mm) long, of suspension system main runner.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. 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.

1.6 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.

1.7 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

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. Warranty Period: 30 years.

1.8 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.

2.2 ACOUSTICAL UNITS

A. Armstrong World Industries, Inc: www.armstrong.com.

B. Acoustical Tile Type ACT- 1: Painted mineral fiber, ASTM E1264 Type III, Form: 1, Pattern EIC with the following characteristics:

1. Size: 24 by 24 inches (600 by 600 mm).
2. Thickness: 7/8 inches (2.1875 mm).
3. Light Reflectance: 85 percent, determined in accordance with ASTM E1264.
4. NRC Range: 0.75 determined in accordance with ASTM E1264.
5. Articulation Class (AC): 170, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
7. Sag/Humidity Resistance: HumiGuard
8. Fire Performance: Class A UL)
9. Edge: Square.
10. Surface Color: White.
11. Suspension System: Exposed grid Type Prelude XL.
12. Products:
    a. Ultima High NRC.
    b. Substitutions: See Section 01 2500 - Substitution Procedures.

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.

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. Minimum 7/8" horizontal flange
2. 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. 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 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. Removals.

B. Moisture mitigation testing.

C. Resilient tile flooring.

D. Resilient base.

E. Installation accessories.

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 12 3200 - Plastic Laminated Casework.

1.4 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

D. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.

E. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004, with Editorial Revision (2014).

F. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.

G. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

H. ASTM F-1869 Test Method for Measuring Moisture Vapor Emissions in Concrete.

I. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs.

J. ASTM F2420 - Standard Test Method for Determining Relative Humidity on the Surface of Concrete

K. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.

L. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

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

H. Current standard warranty, as published by the Manufacturer

I. Current subfloor preparation guidelines, as published by the Manufacturer.

J. Current installation guidelines, as published by the Manufacturer

K. 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 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.
      a. Deliver extra tile to Owner after completion of work.
      b. Furnish tiles in protective packaging with identifying labels.
   3. 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.
      a. Deliver extra tile to Owner after completion of work.
      b. Furnish tiles in protective packaging with identifying labels.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. 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

E. Deliver materials sufficiently in advance of installation to condition materials to the required temperature prior to installation

1.9 MOCK UP

A. Field Samples per Section 01 4000 - Quality Requirements. Provide field samples, dry laid, to demonstrate aesthetic effects of materials in place.

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. 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).

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. 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 TILE FLOORING

A. Luxury Vinyl Tile: .
   1. Manufacturers:
      a. Mannington Commercial; Amtico Signature Collection / Abstract: www.manningtoncommercial.com.
      b. Substitutions: Sec Section 01 2500 - Substitution Procedures
   2. Minimum Requirements: Comply with ASTM F1700, Class III, Type B
   3. Size: 18" x 36" .
   4. VOC Content Limits: As specified in Section 01 6116.
   5. Thickness:.098 inch (2.5 mm). Square edge. 40 mil wear layer (Quantum Guard Elite)
   6. Pattern: As indicated on drawings.
   7. Color: As indicated on drawings.
   8. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648.

B. Vinyl Composition Tile: Match existing quality, colors and pattern .
   1. Manufacturers:
      a. Armstrong or equal to match existing...
   2. Minimum Requirements: Comply with ASTM F1700, Class III.
   3. Square Tile Size: 12 x12:
   4. Pattern: Two color pattern to match existing pattern. See drawings..
   5. Colors (2): Match existing.

2.2 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. As indicated on finish schedule drawing.
      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: 4 inch (100 mm).
   4. Thickness: 0.125 inch (3.2 mm).
   5. Finish: Satin.
   6. Length: 4 foot (1.2 m) sections.

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Adhesive for Luxury Vinyl Tile Flooring:
   1. Manufacturers:
      a. Mannington Commercial.
         a) Amtico High Moisture PS Adhesive
         b) Amtico RP-18 Adhesive Specification

2.4 Substitutions: Section 01 6000 - Product Requirements.

2.5 Flooring Adhesive for Vinyl Composition Tile:

A. Manufacturers:
   1. As reccomended by floor tile manufacturer.
   2. Substitutions: Sec Section 01 2500 - Substitution Procedures

2.6 VinylComposition Tile Adhesives: Latex adhesive, non-flammable, moisture and alkali resistant bond.

A. Adhesive shall be as recommended by the manufacturer, compatible with tile and substrate.

2.7 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.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. 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.

C. 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".

D. 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.

E. Completely remove existing solvent base adhesives to prevent bleeding and staining

F. Prohibit traffic until filler is fully cured.

G. Clean substrate.

3.3 INSTALLATION GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

E. Do not install resilient flooring over building expansion joints.

F. Do not install defective or damaged resilient flooring.

G. 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.

H. Lay resilient flooring to match existing pattern.

I. Install resilient flooring without voids at seams. Lay seams together without stress.

J. Spread only enough adhesive to permit installation of materials before initial set.

K. Fit joints and butt seams tightly.

L. Set flooring in place, press with heavy roller to attain full adhesion.

M. Roll joints with minimum 50# roller.

N. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

O. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

P. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

Q. Remove excess adhesive immediately

3.4 INSTALLATION TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. 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 in pattern of colors and sizes indicated on Drawings.

3.5 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.

3.6 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 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 (per owners choice) following the manufacturer's instructions.

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation and 72 hours heavy rolling loads.

3.8 SCHEDULE

A. Refer to Finish Schedule on drawings

END OF SECTION

SECTION 09 9113
EXTERIOR 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 exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Glass.
   6. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 5000 - Metal Fabrications: Shop-primed items.

C. Section 09 9123 - Interior Painting.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

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 D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

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 6 - Commercial Blast Cleaning; 2007.

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 definitely not required.
3. Allow 15 days for approval process, after receipt of complete samples by Architect.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. 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.

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 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 five (5) years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three (3) years experience.

1.8 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide column & beam assembly illustrating paint color, texture, and finish.

C. Locate where directed by Construction Manager.

D. Mock-up may remain as part of the work.

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. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer.

B. Paints:

1. Base Manufacturer: Sherwin-Williams Company; www.sherwin-williams.com.

C. Substitutions: See Section 01 2500 - Substitution Procedures

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. 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.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. 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. Colors: As indicated on drawings.

2.3 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including galvanized and primed metal.

B. Ferrous Metals, Unprimed Alkyd: Provide the following finish systems over unprimed exterior ferrous metal:

1. Rust inhibiting, modified phenolic alkyd resin primer: Two finish coats over primer
   a. Primer: Sherwin WilliamsKem Kromik Universal Metal Primer spreading rate recommended by manufacturer to achieve a dry film thickness of 3.3 to 4.4 mils.
2. Topcoat: Two Coats Alkyd applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6mils
   a. Sherwin Williams: Pro Industrial Urethan Alkyd Enalmel.

C. Ferrous Metals, Unprimed, Latex, 3 Coat:

1. Rust inhibiting, modified phenolic alkyd resin primer: 2 finish coats over primer
   a. Primer: Sherwin WilliamsKem Kromik Universal Metal Primer spreading rate recommended by manufacturer to achieve a dry film thickness of 3.3 to 4.4 mils.
2. Topcoat: Acrylic Latex applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 2.1 to 4.2 mils
   a. Sherwin Williams: Pro Industrial Acrylic.

D. Ferrous Metals, Primed, Alkyd, 2 Coat:

1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
2. Topcoat: Two Coats Alkyd applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6mils
   a. Sherwin Williams: Direct To Metal Alkyd.

E. Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Topcoat: Acrylic Latex applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 2.5 to 4.0
      a. Sherwin Williams: Pro Industrial Acrylic.

F. Galvanized Metals, Alkyd, 3 Coat:
   1. One coat galvanize primer.
   2. Two coats of alkyd enamel :
      a. Intermediate coat: Alkyd enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6.
         a) Sherwin Williams Direct To
      b. Finish coat: Alkyd enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6.
         a) Sherwin Williams Direct To Metal Alkyd Enamel Semi-Gloss Pure White

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

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 repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to 1.

H. 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 by power wire brushing, power sanding, power grinding, power tool chipping and power tool descaling, using methods recommended in writing by paint manufacturer and 1. Protect from corrosion until coated.

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. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Sand metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. 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 9123
INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Floors, unless specifically indicated.
6. Glass.
7. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.3 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.4 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"), and where the paint shall be used, walls/ceiligns etc.

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.

D. 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.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years experience and approved by manufacturer.

1.6 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the work.

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 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.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:

1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
2. School standard colors to match rooms.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. 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.
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 paint material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, wood, and plaster.

1. One top coat and one coat primer.
2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
   a. Products:

a) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.

B. Paint I-OP-FL - Concrete Floors to be Painted.
1. Two top coats and one coat primer.
2. Top Coat(s): Latex Floor Paint, Low Gloss; MPI #60.
a. Products:
a) Sherwin-Williams Porch and Floor Enamel.

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Interior/Exterior Latex Block Filler; MPI #4.
a. Products:
a) Sherwin-Williams Loxon Block Surfacer. (MPI #4)
b) Substitutions: Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
5. 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, window trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. 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.

F. 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.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. 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.

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. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Touch-up damaged finishes after 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. Emergency evacuation maps.

C. Exterior Dimensional Metal Lettering

D. Building identification signs.

1.3 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls for temporary Project identification signs and for temporary information and directional signs

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 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

1.9 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: two (2) years from date of Substantial Completion

PART 2 PRODUCTS

2.1 PANEL SIGN

A. Manufacturers
   1. Flat Signs:
      a. Crown Signs.
      b. Best Sign Systems, Inc: www.bestsigns.com.

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 , radius comers, and window areas for paper inserts.

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 philips 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

D. Dimensional Letter Signs:
   1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
   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. 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. Classroom and Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
   4. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   5. Rest Rooms: Identify with pictograms, the names as shown on drawings and braille.

C. Emergency Evacuation Maps:
   1. One (1) screen printed fire evacuation sign map per each classroom and entry door of occupied space opening into a corridor.
   2. Map content to be provided by Brewster Central School District. Identify location and direction to exits.
   3. Contractor to provide (1) screen printed fire evacuation sign for each classroom.

D. Building Identification Signs:
   1. Use individual metal letters.
   2. Mount with posts on roof as indicated on the drawings. as indicated on drawings.

2.4 SIGN TYPES

A. Flat Signs: Signage media in matching plastic frame.
   1. Corners: Radiused.
   2. Frame edge: Eased
   3. Wall Mounting of One-Sided Signs: Security type Concealed screws and foam tape.

B. 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.
   5. Frame Color: As selected by Architect.

2.5 TACTILE SIGNAGE MEDIA

A. Applied Character Panels: Acrylic plastic base, with applied acrylic plastic letters and braille.
   1. Total Backer Thickness: 1/16 inch (1.5625 mm).
   2. Letter Thickness: 1/16 inch (1.5625 mm).
   3. Letter Edges: Square.
   4. Total Frame depth: 3/8 inch
   5. Name slot height: 3/4"

2.6 NON-TACTILE SIGNAGE MEDIA

A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:
   1. Sign Color: Clear.
   2. Total Thickness: 1/8 inch (3 mm).

2.7 DIMENSIONAL LETTERS

A. Metal Letters:
   1. Metal: Aluminum casting.
   2. Metal Thickness: 1/8 inch minimum (3 mm)finished face material, 2" overall letter depth.
   3. Letter Height: 24 inches (609.6 mm).
   4. Text and Typeface:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper case only.
   5. Finish: Brushed, satin.
   6. Mounting: As indicated on drawings.

2.8 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 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 Slats: 20 of each type and size.
3. 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.

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.

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.

3.6 SCHEDULE

A. Provide as indicated on the drawings.

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 SUMMARY

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. Custom Reception desk.
      b. Grommets.
      c. Under Counter support panels
      d. Custom units where indicated.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06 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. Division 22 for Stainless steel sinks, fittings, traps, stops, tailpieces, vacuum breakers, electrical outlets and other fixtures, etc. Furnished and installed by plumbing contractor.

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 door 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 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 5 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 and architectural millwork 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. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify Construction Manager of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work.
5. Remove sample units from the premises when directed by the Construction Manager
6. Plastic-laminate products, 8 by 10 inches, for each type, color, pattern, and surface finish.
7. Corner pieces as follows:
   a. Miter joints for standing trim.
8. 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, flexible rail mounted, and mobile casework and accessories.

1. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

B. Regardless of manufacturer or model numbers 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: (Countertops etc.)
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) 335VGS, matte finish, nominal thickness .028+0.001-0.004 as manufactured by Wilsonart Brand Decorative Laminate.
b) 335VGP, matte finish, nominal thickness .028+0.001-0.004 HIGH WEAR as manufactured by Wilsonart Brand Decorative Laminate.
c) 12/HGP High Pressure Grade (Standard grade) .028" as manufactured by Formica Brand 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. Wall Panel System: Media Center Reception Desk
1. Concealed Clip Hangers
2. Two piece interlocking assembly.
3. Extruded 6063-T6 aluminum in accordance to ASTM B 221; mill finish.
a. Product: Monarch Z Clip: MF-375, . Phone: 631-563-8967; zclip@monarchmetal.com.

D. 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.

E. 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.

F. 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.

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. Mirrors: 1/8 inch thick mirrored acrylic, break and impact resistant.

G. Exposed Fastener: (at Reception Desk):
1. #8 Simpson-Strongtie, SS screw, Model #S08C07KQC.

H. Under Counter Support panels.
1. See drawing details.

I. Grommets: Mockett, mocket.com; "BRV2" flush mounted, single slot with steel cap.
1. Finish Satin aluminum.

J. Cable/Data Trays: Provide plastic laminate tray where shown on drawings.

2.4 LOCKS:

A. Provide for all doors and drawers. Locks shall be, removable core, pin tumbler, cam style lock 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 SOLID SURFACING COUNTERTOP

A. Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. E. I. du Pont de Nemours and Company “Corian” , 2 " thick quartz.
   b. Colors and Patterns: As selected by Architect from manufacturer's full range.
   c. See drawings for details.

2.6 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.

C. Drawers:

1. Sides, back and sub front shall be particleboard, 1/2" thick, laminated with TFL in dove gray, frosty white or light beige to match basic cabinet body color. The back and sub front are doweled and glued into the sides. Dowels shall be fluted, with chamfered ends and a minimum diameter of 8 mm. Top edges is banded with 3 mm PVC edging in a matching color.

a. Drawer bottom shall be particleboard, 1/2" thick, laminated with TFL in color to match basic cabinet body color, screwed directly to the bottom edges of the drawer box. Drawer bottom less than 1/2" thick will not be permitted.

b. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with Thermally Fused Laminate (TFL).. Minimum 1/2 inch thick particleboard

drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer

c. Painted finishes on drawer sides and/or bottom will not be permitted.

D. Door/Drawer Fronts:

1. Laminated door and drawer fronts shall be 13/16 inch (20.6 mm) finished thickness for all hinged and sliding doors. Drawer fronts and hinged doors shall overlay cabinet end panels, as reveal overlay designthe cabinet body. Maintain a maximum 1/8 inch (3.2 mm) reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
2. Double doors shall be used on all cabinets in excess of 24" wide.
3. Exterior faces shall be laminated with high pressure decorative laminate specified, color as selected. Interior face shall be high balanced with pressure cabinet liner CL20.
4. All edges shall be finished with 3mm PVC available in color as selected by the Architect. External edges and outside corners shall be machine profiled to 1/8” radius.

E. Miscellaneous Shelving (not in Cabinets):

1. Core material: 1 inch thick particleboard.
2. High-pressure decorative VGS laminate on both faces.
3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius

2.7 ACCESS PANELS:

A. Provide removal full width, back panels and closure panels with tamper proof screws cam lock for access to heating and/or plumbing valves, traps, etc. as required. Coordinate with mechanical/electrical drawings and prime contracts.

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 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 other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Carpet mat.

B. Recessed mat frames.

1.3 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.

D. Samples: Submit two samples, 12 by 12 inch (300 by 300 mm) in size illustrating pattern, color, finish, edging.

1.4 QUALITY ASSURANCE

A. Flammability: Critical radiant flux 0.45 watts/m2 or greater, in accordance with ASTM E648. Life Safety Code® NFPA 101, Class 1 Interior Floor Finish Testing and Classification

B. Slip Resistance: Coefficient of friction 0.60 or greater, in accordance with ASTM D2047 tested in wet conditions

C. Rolling Load: No deformation with 300 lb/wheel and minimum of 2500 passes. Load applied to a 5” diameter, 2” wide solid polyurethane wheel.

D. Single Source: Obtain entrance matting and frames from a single source to ensure dimensional compatibility

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened original factory packaging, labeled to identify product and manufacturer. Store in controlled environment. To avoid damage do not stack other material on top of matting or frames

1.6 PROJECT CONDITIONS

A. Coordinate installation of recess frame with concrete construction. Install frames to ensure Dimensions provided in shop drawings are maintained. Finished recess must be flat and level. Defer frame installation until related interior finish work is in progress

PART 2 PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B221, alloy 6105-T5 and 6063-T5 for extrusions.

B. Architectural Bronze: ASTM B455, alloy 385 for extrusions.

C. Rigid Vinyl: High impact, rigid PVC.

D. Flexible Vinyl: 80 Durometer, flexible PVC.

2.2 ENTRANCE MAT and FRAME

A. Mat: 24 X 24 Tufted Carpet Tile
   1. Mohawk Group. First Step II - Tuff Stuff II.
      a. Color: 955, Cobalt
      b. Style: GT 315

c. Density: 6739
d. Pile Wt.: 38 oz. sq.yd.
e. Backing : EcoFlex NXT

B. Frame: (See drawings for dimensions)
1. Schluter Systems
a. Material: Stainless steel
b. Style: Deco

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.

B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor surface 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.

3.4 TOLERANCES

A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch (6 mm).

END OF SECTION

SECTION 14 2020
ELEVATOR MODERNIZATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Include all labor, materials, equipment and appliances required for the furnishing, installing, and testing, complete and ready for operation in a manner satisfactory to the Elevator Consultant, all the work specified herein.

1. One (1) direct acting, hydraulic passenger elevator.
2. Car enclosure, including floor covering and car doors, hangers and operating devices for car doors and landing doors.
3. Signals and trail cables for signals and communication system.
4. All controls and signal equipment.
5. Inter-communications system and two-way hands-free, that complies with the latest A17.1 code, Rule No. 2.27.1 thru 2.27.1.1.5..
6. Clean entire shaft, including wash down of all rails, separator beams, etc.
7. Vertical pit access ladder.
8. Machine room and pit GFI duplex receptacles.

1.2 INTENT OF SPECIFICATIONS

A. The entire installation shall be as herein specified.

B. The type, duty, etc., of this elevator shall be in accordance with the data hereinafter specified.

C. Wherever in these specifications the words "provide", "furnish" and “install” means supply and deliver only or similar term is used in the sense of furnishing apparatus or materials, it shall mean that the Contractor for this work shall supply, deliver, unload, unpack, assemble, install and connect such apparatus or materials to which it is referred, except as may otherwise be specifically defined.

D. Bring to the attention of the Architect immediately any changes in the size or location of the material or equipment which may be necessary in order to meet field conditions, or in order to avoid conflict with the equipment of other Sections. Obtain the Architect acceptance before such deviations are made.

E. It is the intent of these specifications to provide a complete system, and all necessary labor and materials, whether or not specifically mentioned herein, shall be included and left in good working order, ready for operation.

F. Locate all equipment and accessories in such a manner as to provide easy access for proper service and maintenance.

1.3 CHASES, CUTTING AND PATCHING

A. The cost of cutting and patching of walls, partitions, ceilings and floors necessary for reception of work shall be borne under this Section.

B. When it becomes necessary to cut finished materials, provide proper protection as to protect the surrounding areas.

C. Any damage to personal property caused by the contractor’s work shall be repaired, cleaned, etc. and all costs shall be paid for by the Contractor.

1.4 STANDARDS

A. Materials specified by reference to a specific standard such as the American Society of Testing Materials, Underwriters' Laboratories, American National Standards Institute, Federal Specifications, a trade association standard, or other similar standard shall comply with the requirement in the latest revision thereof, in effect at the time of bidding, except as limited by type, class or grade, or modified in such reference.

1.5 DEFINITIONS

A. All terms in the specifications have the definition given in the Safety Code for Elevators, Escalators and Dumbwaiters as approved by the American National Standard Institute, latest edition, including all revisions and changes authorized by the Sectional Committee on Elevator Safety Code to date of these specifications. Hereafter in these specifications, the abbreviation "ANSI Code" shall be understood to refer to this Code.

1.6 NOTICE TO BIDDERS

A. Before submitting proposals, examine the specifications relating to the work and become fully informed as to the extent and character of the work and the relation of the work to the work of other Sections.

1.7 SPECIAL TREATMENTS

A. The Elevator Consultant will accept no exposed fasteners and no manufacturers' logos or trademarks on any material or equipment provided in these specifications.

1.8 INSURANCE

A. In addition to the requirements set forth in the AIA Document A107, the Contractor shall obtain and maintain, during the entire period of performance of Contractor's work, Workmen's Compensation Insurance, public liability insurance, NYS Disability Insurance and completed operations and product insurance with companies licensed to do and doing business as insurers inthe State of New York. Said public liability insurance shall be in minimum limits of $1,000,000 for injury or death to persons, and $500,000 for damage to property, which insurance policy shall name and indemnify the Owner, Brewster High School, Fuller & D'Angleo Architects and G. D. C. & Associates. Before the commencement of this work the Contractor shall deliver to the Owner certificates evidencing the existence of such insurance and providing that such insurance shall not be modified or terminated except upon ten (10) days prior written notice to Owner.

1.9 DESCRIPTION OF ELEVATOR SYSTEMS

A. Passenger Elevator

1.	Quantity	One (1)
2.	Capacity	2000 pounds
3.	100 feet per minute.	
4.	Travel	Existing, approx. 21'-0".
5.	Floors	G, 1, 2.
6.	Number of Landings	3 in line
7.	Operation	Simplex Collective w/wo Independent Service
8.	Special Operations	Fire Emergency Service, Phase I & II,
9.	Handicapped Features, Intercom	
	a. Independent Service, two-way Hands-free communication system	
10.	Buffers	Spring
11.	Car Enclosure	Remodel, $20,000.00 allowance
12.	Landing Doors	Reuse existing, new hangers, tracks, etc.
13.	Signals	Call acknowledging lights, car position indicators, car travel lanterns, hall position Indicators
14.	Pump Unit	Ground

15. Communication Equipment — Two-way Intercommunication system and outside Hands free communication system That complies with the A17.1 code, Rule No. 2.27.1..
    a. Power Supply — Existing.

1.10 LAWS AND ORDINANCES

A. All current local and State laws and regulations, Occupational Safety and Health Administration Rules, ADA requirements, A117.1, ASME, A17.1, and National Fire Protection Association's recommendations, governing or relating to any portion of this work are hereby made a part of these specifications; responsibility for compliance to their provisions is included.

B. Inform the Owner of any work or materials which violates any of the applicable laws and regulations before proceeding with the work.

1.11 APPLICABLE CODES AND SPECIFICATIONS

A. Only the current editions and revisions of referenced codes ASME A17.1 & A117.1 and specifications shall be applicable for the work of this Section.

B. All construction, workmanship and materials, all factors of safety used in designing all structural and working parts of the equipment, and unless herein specifically modified or otherwise shown on the drawings, all top and bottom clearances and the construction and operation of all safety devices shall be in full accordance with the requirements of ANSI Code. In addition, all such equipment and clearances shall fulfill the rules, regulations and codes of all local bodies having jurisdiction.

C. Where the requirements of the ANSI Code are more severe than local rules, regulations and codes, the ANSI Code shall govern.

D. Factors of safety, buffers, guide rails, top and bottom terminals stopping devices, emergency

E. In addition, the equipment shall conform to certain special safety requirements as given in these specifications.

1.12 EXAMINATION OF EXISTING CONDITIONS

A. Visit and carefully examine those portions of the site and/or present buildings affected by this work so as to become familiar with existing conditions and difficulties that will attend the execution of the work, before submitting proposals.

B. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

1.13 DAMAGE TO PROPERTY

A. Restore to its original condition without extra payment any of the Owner property that shall become damaged due to the negligence of any employees or agents of the Contractors.

B. Such repairs shall meet the acceptance of the Owner.

C. Take proper care and protect all portions of the work until its acceptance. Any and all portions of work liable to damage under this or other Sections or by freezing or inclement weather must be thoroughly and securely protected by a substantial boarding or covering until not further required. It shall be removed from the premises only when its removal is directed by the Owner.

D. Protect all plated and polished material and trimming against damage.

1.14 WORK IN EXISTING BUILDING

A. Caution is hereby given that the work shall be performed, so as to cause the least possible inconvenience and disturbance to the occupants.

B. The proposal for work in the existing building shall be predicated on the performance of the work during regular working hours. When so directed, however, install work in overtime and the additional cost charged therefore shall be only "premium" portion of the wages paid.

C. All scarp and debris, except as otherwise specified, shall be removed from the building and disposed of by the Contractor. When requested by the Owner, move equipment to a storage place on the premises and leave, as property of the Owner.

1.15 DELIVERY OF MATERIALS AND EQUIPMENT

A. Store materials and equipment where directed by the Owner. Any damage caused by any overloading of the structure shall be repaired at no additional cost to the Owner. Include the hoisting of all materials and equipment and assume all responsibility for such hoisting equipment.

1.16 WARRANTY

A. Provide special project warranty, signed by contractor, installer and manufacturer, agreeing to replace/restore defective materials and workmanship of elevator work during warranty period. “Defective” includes, but is not limited to operation or control system failures, performance below required materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration and similar unusual, unexpected and unsatisfactory conditions.

B. The warranty period is 12 months, starting on the date of final acceptance of the elevator work, as evidenced by the Consultant's approval in writing.

1.17 SHOP DRAWINGS AND SAMPLES

A. Submit four (4) hard copies, " emails are unacceptable", of the following shop drawings, and obtain written acceptance of same before ordering or installing any equipment or materials.

B. Machine room layout.

C. Hydraulic pump unit.

D. Hydraulic oil cooler.

E. Hydraulic jack unit & PVC liner

F. Signal fixtures, that complies with the latest A17.1 code, Rule No. 2.27.1..

G. Car roller guide.

H. Controller information with manufacture doors.

I. Communication systems, that complies with the latest A17.1 code, Rule No. 2.27.1..

J. Hatchway and car door equipment

K. Cab drawings

L. Shop drawings of equipment shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature which shall indicate the construction, including material and physical dimensions, and complete operating data.

M. Submit for acceptance samples requested. The samples shall be properly tagged and shall remain in the Owner’s possession until final acceptance of the work.

1.18 WIRING DIAGRAMS

A. The Contractor shall furnish two (2) complete sets of wiring diagrams, showing the electrical connections, functions and sequence of operation of all apparatus connected with the work; and all data and instructions necessary for the proper maintenance and repair of all equipment. All

items that do not apply directly to this installation shall be omitted from the final diagrams, and these diagrams should reflect all field and/or shop changes.

1.19 MAINTENANCE

A. Provide for a period of twelve (12) months after completion and acceptance of all equipment, evident by the Consultant's final report, 24/7 full maintenance/service of the equipment. This maintenance shall include systematic examinations and adjustments and lubrication of all elevator equipment. The Contractor shall also repair or replace electrical and mechanical parts of the equipment whenever this is required and shall use only genuine standard parts produced by the manufacturer of the equipment concerned. Renewals or repairs necessitated by reason of negligence of misuse of the equipment or by reason of any other cause beyond the control of the Contractor or his supplier, except ordinary wear and tear, shall not be the responsibility of the Contractor.

B. All work under this maintenance provision shall be performed by competent personnel under the supervision and in the direct employ of the Contractor. Work shall be done during the Contractor's regular work day.

C. At the completion of the modernization and acceptance, the free- service/maintenance as outlined in 'a' above will become effective.

1.20 PROPOSALS FOR SERVICE CONTRACT (ALTERNATE ELEV-1)

A. Bidders for the work under this Section shall submit with their proposals, as a separate cost item, proposals for a service contract based on the requirements hereinafter specified. These proposals are requested for the purpose of determining which elevator manufacturers' proposals for the Elevator Work and for a Service Contract, when combined, are in the best interest of the Owner and may be accepted at his option.

B. Requirements under Service Contract:

1. Term: Two years, becoming effective at the termination of the free service and guarantee period as hereinbefore specified.
2. Service shall include regular examinations of the installation by competent and trained employees of the Elevator Contractor; and shall include all necessary adjustments, greasing, oiling, cleaning, supplies, inspections, safety tests and replacement of parts required to keep the equipment in perfect operation.
3. Maintenance service shall be performed during the normal working days and hours of the Elevator Contractor and shall include 24 hour, seven-day a week call back service.
4. An annual adjustment in the cost of the Service Contract shall be made at the end of each year the contract is in effect. Adjustments shall be for the cost of labor and material only. Adjustment for labor shall be based upon the percentage of increase or decrease in the straight hourly rate, plus fringe benefits paid to employees of the Contractor performing the Service Work. Adjustment for materials shall be based upon the percentage of increase or decrease shown by the index of "Wholesale Commodity Prices for Metal and Metal Products" published by the U. S. Department of Labor, Bureau of Statistics.

PART 2 - PRODUCTS

2.1 ACCEPTED MATERIALS

A. Materials and equipment shall be new, of makes and kinds specified herein, without exception. Where one brand, make of material, device or equipment is specified, the products of the manufacturers listed in "ACCEPTED MANUFACTURERS" shall be regarded as acceptable when, in the opinion of the

Consultant , it is a recognized equal considering quality, workmanship, economy of operation, and suitability for the purpose intended.

B. Should a bidder desire to install equipment and materials other than those included under "ACCEPTED MATERIALS" he shall submit with his bid a rider listing the deductions or additions to the Contract for these substitutions. Said substitutions must be accepted in writing by the Consultant, otherwise all materials and equipment must be according to plans and specifications.

2.2 ACCEPTED MANUFACTURERS

A. All materials shall be in strict accordance with the quality, style, performance and sizes hereinbefore specified. Manufacturer's names and catalog numbers are given in the specifications for the purpose of establishing a standard of quality, style, size and type and shall not be construed to exclude equipment or material of other manufacturers.

B. To furnish equipment of a manufacturer other than that specified or listed hereinafter, include a complete specification of the substituted item along with each submission copy of shop drawings. Write specifications as close as possible over the Specifications; each paragraph shall bear the same paragraph number as the Specifications so that close comparison can be made with the equipment specified. Changes shall be subject to the complete acceptance of the Consultant.

C. When materials and equipment are purchased from the manufacturer specified or listed hereinafter, submit complete verification product data specifications with each copy of shop drawings.

D. WIRING
1. B.I.W. Cable Systems Inc.
2. Siecor Republic Wire & Cable
3. Draka Traveler Cable

E. POWER UNITS
1. Mongrain elevator Products
2. Canton
3. Cemcolift
4. M.E.I. Hydraulics', Inc.

F. JACK CLYINDERS
1. Mongrain Elevator Products.
2. Canton
3. Cemcolift
4. M.E.I. Hydraulics', Inc.

G. CONTROLLERS
1. G.A.L. Galaxy
2. Smartrise Engineering
3. Elevator Controls
4. Claddagh Electronics

H. LEVELING DEVICE
1. Claddagh Electronics
2. G.A.L. Galaxy
3. Smartrise Engineering
4. Elevator Controls

I. SIGNAL FIXTURES
1. G.A.L.
2. Monitor Controls
3. Innovation Industries

J. HANGERS AND TRACKS
1. G.A.L.

K. DOOR OPERATOR
1. G.A.L.

L. CAB ENCLOSURES
1. ECI-EDI
2. National Cab
3. Liberty Elevator Cabs
4. Cab-Tech Elevator Design

2.3 TYPE OF EQUIPMENT

A. The direct acting plunger for this elevator shall be replaced in its entirety, as herein after specified. Provide a non-proprietary power unit, storage tank and magnetic control valves. Power unit and associated control equipment shall be in a machine room.

B. Provide a non-proprietary pump that shall deliver the oil directly into the cylinders at the necessary pressure and in sufficient quantity to lift the fully loaded elevator at the specified speed. The tank shall act as a storage tank only and the oil shall be pumped from the tank into the cylinder on the "Up" trip and shall be returned into the tank on the "Down" trip.

2.4 ELEVATOR CYLINDER & PLUNGER

A. The cylinder and plunger for this elevator shall be removed in its entirety and the following provided :
1. Hydro-excavate/clean out the existing jack hole.
2. Provide a drill casing during the drilling even when drilling through solid rock.
3. Install a Schedule 40 PVC waterproof casing with a 6" wide PVC water-stop ring to be cast in the pit floor. Cap the waterproof casing until ready to be used. No casing shall be installed without advance notification to the Consultant. Any installation made without inspector present will be rejected.
4. The PVC liner shall extend six inches, (6") above the pit floor.
5. Design and construct the jack units in accordance with the applicable requirements of the ASME Code. It shall be of sufficient size to lift the gross load at the rated speed to the height specified and shall be factory tested to ensure adequate strength and freedom from leakage. No brittle material, such as gray cast iron, shall be used in the jack construction.
6. The jack unit shall consist of:
   a. A plunger of heavy seamless steel tubing turned smooth and true to +/- .15 inches tolerance, and with no diameter change greater than .04 inches per foot of length.
   b. A stop ring electrically welded to the plunger to prevent plunger leaving its cylinder.
   c. nternal guide bearing.
   d. Cylinder head with removable packing gland to facilitate replacement of packing.
   e. A drip ring below cylinder head to collect oil.
   f. A bleeder valve to release gases from the system.
7. Install the jack units plumb.
8. The jack unit shall be designed for direct acting hydraulic application.

2.5 ELEVATOR SUMP PUMP

A. 1. Provide a sump pump pit, 2'-0" x 2'-0" x 2'-0".

B. 2. Provide a Stancor oil minder control system, submersible 2" discharge sump pump, Model S.E. 50 or approved equal, shall be furnished as a complete unit.

C. 3. Pump shall be hermetically sealed dry run type with epoxy encapsulation, which is non aging, moisture, acid and alkali resistant permitting pumps to operate without overheating

at a low or no water level.

D. Pump shall be submersible type. Cast iron construction, bronze impeller, semi-open type.

E. Heavy duty mechanical with faces "silicon carbide" coated, stainless steel self-cleaning suction strainer, 20" of neoprene jacketed power cable, 300 series stainless steel shaft.

F. 5. Pump to have the capacity of 50 GPM at a total dynamic head of 15 feet and to operate at 3600 RPM. Pump to have curve characteristic, so as not to overload the 1/2 HP motor at any point, throughout its engine range.

G. Motor to be 1/2 HP, 1 phase, 60 hertz, 120 volts, 3600 RPM, with housed in air filter water tight cast iron motor with the windings having class "F" installation, NEMA-G and prelubricated double sealed bearings. Oil filled motors, are not acceptable.

H. Pump to have an oil detection system, utilizing stainless steel electrode sensors and a oil detection relay panel.

I. Provide check and gate valves on the discharge of the pump. Complete the piping to the nearest indirect legal drain and clean basin of all debris, before starting pump into operation.

J. Provide a perforated steel cover over the sump pump pit, flush with the pit floor.

2.6 MACHINE ROOM EQUIPMENT

A. Pump Motor

1. Provide an alternating current induction motor, maximum speed of 1800 RPM, 120 starts per hour, continuous rated, 50oC temperature rise.

B. Power Unit

1. Provide a non-proprietary submersible self-contained power unit. It shall include: a structural steel outer base, including tank supports; a 16 gauge oil tight drip pan; a floating inner base so that there is no metallic contact for mounting the motor pump assembly; sound isolation panels to enclose the unit and reduce airborne noises.
2. The power units shall be designed to hold an additional fifty (50) gallons more than required (a heat dissipation reservoir).
3. Provide a reinforced overhead oil reservoir with a tight fitting tank over the oil control unit.
4. Included in the reservoir shall be an oil fill strainer with air filter and oil level gauge assembly, and a self-cleaning 40-micron strainer in the suction line.
5. Design the pump for oil hydraulic elevator service. It shall be of the positive displacement gear; piston or vane type inherently designed for steady discharge with minimum pulsation and will give smooth quiet operation.
6. The oil control unit shall be of the manufacturer's own design but shall include relief, safety check, start and slow down valves.
7. Use lowering and leveling valves for drop away speed, lowering speed, leveling speed and stopping speed to insure smooth down starts and stops.
8. Provide a valve for manual lowering of the elevator car in event of power failure and for use in servicing and adjusting the elevator mechanism.
9. Design the tank shut-off valve for isolating oil in the power unit tank to ensure each of servicing and adjusting the elevator mechanism without removing oil from the tank.
10. All valves shall be accessible for adjustment. All adjustment shall be made without removing the assembly from the oil line.
11. Provide a temperature control device in power unit for hydraulic oil to maintain optimum level of operation.

12. Manufacturer the unit to operate under 400 psi working pressure.
13. Provide manufacturer's standard oil cooler sized and designed to maintain a maximum oil temperature of 125 degrees F. in a machine room conditioned to operate at a maximum ambient temperature of 95 degrees F.
14. Where elevator is located in unconditioned space, provide a thermostatically controlled heater in the oil tank to maintain proper operating oil temperature.
15. When the oil reservoir thermostat registers 50°F, the car shall “exercise” (run up and down without opening its doors) until the oil temperature reaches to 75°F.

2.7 MUFFLER

A. Provide a blowout-proof muffler, or an isolating coupling in the pipeline between the pumping unit and the cylinder head of the elevator.

2.8 PIPING

A. The existing piping couplers, valves, etc. shall be removed and new piping provided between tank, operating valve and cylinder, complete with necessary valves and fittings of the elevator. All piping and fittings shall be steel or wrought iron, socket welded and flanged type of sizes required and shall withstand a test pressure of 400 pounds per square inch. In addition to valves required for normal operation, provide a gate valve in supply line to cylinder in the pit.

2.9 CONTROLLERS

A. The elevator controller provided shall be a non-proprietary microprocessor controller

that will comply with ANSI/ASME 17.1 elevator safety codes. The controller shall provide built in on board LCD diagnostics with a plain English display. All input/output signals shall be coded with an LED readout indicating call registration, burned out lamps, car position, elevator status and mode of operation, and all circuit registration indicators. All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices. Controllers that do not provide LED readout on all input and output signals, do not provide plain English diagnostic display, or require the hook up of external diagnostic tools are not acceptable.

B. All safety relays provided on the controller shall be DC voltage relays to improve low voltage relay latching. The controller shall not allow the car to run or operate in the event of any short circuit or ground fault. The controller shall not permit the car to run if any door or hoistway interlock is not latched in the correct manner. In addition, while on inspection or hoistway operation, the car shall not run or operate if any ground faults are detected even if all hoistway door locks and contacts are closed and latched.

C. The controller shall be programmed to park the car at the main floor, but shall contain a disconnect switch mounted on the controller to disconnect this feature.

D. Provide reduced voltage (solid state) type of starting for the pump motor.

E. Provide this controller with the manufactures' cover/door.

2.10 CAR LEVELING DEVICE

A. Provide the elevator with an accepted car leveling device that shall automatically bring the car to a position level +/- 1/4" with any floor, regardless of the load in the car or its direction of motion. The device shall correct over-travel and under-travel. Correction shall be in small

steps without surges to eliminate tripping hazard.

B. Leveling to IP 8300 or approved equal.

2.11 CAR SLING AND PLATFORM

A. The car platform shall be retained and reused.

B. The car sling shall be retained and reused.

C. Finished floor shall be black V.C.T. tiles with steel studs.

D. Provide each elevator car platform with a sheet steel toe guard, the full width of door opening and extending downward from the car sill a distance of approximately 21", with the lower edge curved inward.

E. Provide on top of this car an inspection station.

F. Provide the elevator with suitable receptacles fitted with wire lamp guards on top of the car and beneath the car platform. Provide a suitable plug receptacle on top and bottom of the car.

G. Provide the car entrance with a one piece non-slip aluminum saddle/sill.

2.12 RAILS

A. The present guide rails shall be retained and reused. All guide rails shall be cleaned, all bracket and rail bolts shall be tightened, all joints adjusted and filed.

2.13 SHAFT CLEANING

A. The entire shaft of this elevator from the pit floor to the overhead concrete slab shall be thoroughly cleaned of all debris, lint , grease, dust, etc.

2.14 ROLLER GUIDES

A. Provide the elevator with 3" roller guides on top and bottom of the car frame. Each roller guide shall consist of three (3) rubber tired wheels to run on the three (3) finished rail surfaces. The wheels shall be equipped with ball bearings and shall be held against the rail surfaces by adjustable springs, all contained on a substantial metal base. The roller guides shall run on dry guide rails, not lubricated. All rollers are to be free enough to turn by hand with a minimum of pressure.

B. Roller guides to be Elsco Model D.

2.15 TERMINAL STOP DEVICES

A. Provide upper and lower normal terminal stopping devices that shall be arranged to automatically stop the car from speed specified within the top clearance and bottom over-travel independent of the operating device, final terminal stopping device and the buffers.

B. Provide final terminal stop devices that shall automatically stop the car from speed specified within the top clearance and bottom over-travel independent of the operation of the normal terminal stopping device with the buffers operative.

C. Final terminal stopping devices shall be through bolted to the rails.

2.16 CAR BUFFERS

A. The present car spring buffers and related support steel shall be replaced in it's entirety.

B. Provide a switch in the pit, arranged to interrupt the power supply and apply the brake independently of the regular operating device to permit safe access to pit for servicing.

C. Provide a complete lighting system and a G.F.I. duplex receptacle in the pit.

D. Provide a steel ladder in the pit, properly secured to the shaft wall and extending 48" above the ground floor.

2.17 CAR POSITION INDICATOR

A. Provide a car position indicator consisting of a readout two inches high with directional arrows and located at the top of the car operating panel to indicate the car position to the passengers.

B. Readouts in the car station shall be two inches planar, neon gas discharge displays, alphanumeric type, neon red color with 130 degree viewing angle or approved equal.

2.18 HALL POSITION INDICATORS

A. Provide a hall position indicator for this elevator consisting of a readout one inch (1") high with direction arrows and locate in each hall station at each floor to indicate the

car position to the waiting passengers.

2.19 CAR SIGNAL AND OPERATING PANEL

A. Provide a panel selected from Contractor's stock designs, stainless steel and surface mounted.

B. The following items shall be included on the panel unless otherwise specified:
1. A complete set of vandal-proof (positive stop) pushbuttons corresponding to each floor served, with "call registered lights" in the button in each car station. Provide floor numerals in the button.
2. The open door button.
3. The safety switch. (Emergency stop switch), (keyed operated).
4. The fan switch, (two speed).
5. The car light switch.
6. The Independent key switch.
7. The inspection/access key switch.
8. Emergency light with battery and trickle charger.
9. Emergency light test button.
10. Fireman's return service cabinet.
11. Fireman’s Phase II operation to be engraved in the panel.
12. Cutout for grille for hands free emergency telephone.
13. Provisions that comply with the A17.1 code, Rule No. 2.27.1..
14. Two inch high floor indicator with directional arrows..
15. "NO SMOKING" to be engraved in one inch (1”) letters.
16. Brewster High School to be engraved in one inch (1”) letters.
17. Capacity to be engraved in 3/4" letters.
18. The above items which do not pertain to the operator-less system shall be ineffective when on operator-less operation.
19. The car signal panel shall be located as required by Code and shall include the markings adjacent to each button, switch, etc. The Braille indications shall be engraved in the plate. Applied plates will not be accepted.
20. Plate to be secured by the Ace type locks and properly hinged to prevent bowing.
21. All keyed switches, except the emergency stop switch, shall be behind a keyed cover.

2.20 CAR PUSHBUTTONS

A. All car pushbuttons shall be vandal-proof (positive stop) with legible floor designation in the button "with call registered lights in the buttons". The circuit set up by the pressing of a signal button on the car control panel shall be reset or extinguished when arriving at the designated floor.

2.21 SAFETY SWITCH, (Emergency Stop Switch), (Keyed Operated)

A. Provide a safety switch which shall be of a distinct color from the other switches and pushbuttons and shall be so located, etc., as not to become confused with the other switches. The operation of the safety switch shall cut off all power, apply the brake and ring a 6" diameter bell under the car platform.

2.22 DIRECTIONAL LANTERN

A. Provide a vandal-proof directional lantern in both car door jambs with double lights. The lantern shall be connected into the control and signal system so that the proper light will be illuminated as a car approaches to stop at a floor in answer to a call.

B. Provide in each lantern a single stroke bell and connect to ring the number of times as required by Code when lights are energized.

2.23 LANDING PUSHBUTTONS

A. Provide landing pushbutton call station, flush mounted and shall be of the vandal-proof type with arrows engraved in the button with "call registered lights in the button" as hereinbefore described. Button mechanism shall be of substantial construction for expected use. Contacts shall be of the rubbing type of silver or construction metal and shall be arranged so as to equalize pressure and prevent undue compression of the springs. Buttons shall be of the short throw type and be 1-1/4" outer diameter.

B. Locate the pushbuttons at the required ADA height.

C. Provide a 1" readout with directions arrows in each landing pushbutton.

D. Provide required signage on each hall station, as outlined in "Appendix O" of A17.1 code.

E. Provide a spring loaded key switch in each hallway call button to activate the hall button.

F. Cover plates to be stainless steel.

2.24 ELEVATOR COMMUNICATION SYSTEM

A. Provide all equipment, accessories and materials complete and in strict accordance with the specifications and the A17.1 code, Rule No. 2.27.1.. All materials and/or equipment necessary for proper operation of the system not specified or described herein shall be deemed part of this specification.

B. Provide facilities for originating call and establishing two-way communication from the elevator cab to the machine room.

C. Provide facilities for complying with the requirements of the hands-free communication as outlined in the ADA law.

D. Provide a trickle charger and battery as a part of the communication system. In the event of a power failure, the battery shall be able to provide for full communication for a period of two (2) hours.

2.25 CAR DOOR HANGERS AND TRACKS

A. Provide non-proprietary hangers for car doors and hatchway doors of the heavy duty sheave type, consisting of two ball bearing sheaves not less than 3-1/4" diameter, enclosed in heavy steel housings. The track shall be of high carbon steel not less than 2" x 1/2". Sheave wheels for the car door hangers shall be made of, or tired with, a suitable sound reducing material other than rubber. Sheave wheels for hatchway door hangers shall be made of steel tired suit suitable sound reducing material other than rubber. All sheave wheels shall rotate in a grease packed precision ball bearing. Each hanger shall be equipped with two (2) ball bearing upthrust rollers not less than 1-1/2" diameter with eccentric adjustment.

B. Provide new rubber astragals on each car and hall doors.

2.26 HATCHWAY DOOR AND CAR DOOR CONTACTS

A. Provide each elevator hatchway door and the car door with a electric switch which will prevent the operation of the elevator unless the car door is closed and all hatchway doors are locked in the closed position.

B. These switches shall be positive in operation and must be so located and designed as to be protected from mechanical injury and the possibility of short circuits.

2.27 ELECTRIC DOOR OPERATORS

A. Provide a non-proprietary medium speed electric door operator for capable of operating a hoistway door and car door simultaneously from the closed position to within three (3) inches of full-open position (or vice versa) at a speed of approximately two and one-half (2-1/2) feet per second. The closing speed shall be slightly slower than the opening speed. The movement of the hatchway and car doors shall be controlled simultaneously by the normal operation of the elevator controls. The doors shall operate smoothly and without slam in both opening and closing directions. Each hatchway and car door shall be cushioned in its final movement in each direction of travel. Electric power shall be used in the opening and electric or spring power may be used in the closing movement.

B. All levers operating the doors shall be constructed of heavy steel members and all their pivot points shall have ball or roller bearing of not less than one (1) inch outside diameter or bronzed bushed bearings of ample size with positive means of lubrication. In case of interruption or failure of the electric power from any cause, the mechanism shall be so designed that it shall permit manual emergency operation of both the hatchway and car doors and the hatchway doors shall continue during emergency operation to be self-locking. The door operators shall operate in conjunction with, or incorporate in their design, or be equipped with all interlocks or safety switches herein specified.

C. Provide a 8" Z-bar reinforcement on each car door and locate between the nylon guides.

D. Provide a door protection unit.

2.28 HATCHWAY ENTRANCES

A. The existing entrances shall be retained and reused, but the doors shall be provided with new hangers and tracks as hereinafter specified, new nylon bottom door guides and reinforced to accept power operation. A reinforcement shall be installed at the center of each panel and to be located between the two bottom guides. Such reinforcement shall be fabricated of twelve (12) gauge stainless or galvanized steel and shall have a minimum length of eight (8) inches and minimum height of two and one fourth inches (2-1/4") for single panel sliding doors. Multiple panel doors shall be equipped with such reinforcement equal in length to the bottom guides and a minimum height of 2-1/4". The reinforcement shall engage the corresponding member by not less than three eighths (3/8"),

B. Provide drop key access holes and ferrules in each hatchway door.

C. Provide Braille jamb plates at every landing (locate at ADA height).

2.29 HOISTWAY ACCESS SWITCH

A. Install a cylindrical type keyed switch at top and bottom terminal in order to permit the car to be moved at slow speed with the doors open to allow authorized persons to obtain access to the top of the car and to pit. This switch shall be keyed alike to the car "inspection" switch inside cab panel.

B. Locate the switch in the terminal hall stations.

C. This switch is to be of the continuous pressure spring-return type, and shall be operated by a cylinder-type lock having not less than a five (5) pin or five (5) disc combination with the key removable only in the "OFF" position. The lock shall not be operable by any key that operates locks or devices used for other purposes in the building and shall be available to and used only by inspectors, maintenance men and repairmen.

D. All switches, shall be key-operated and behind a keyed cover.

2.30 CAR ENCLOSURE

A. The sum of $20,000.00 shall be allowed for this car enclosure.

B. The net allowance for this car enclosure is to be exclusive of any handling charge, applicable sales and/or use taxes, car door hangers, interlocks, exit contacts locks, platform or flooring, car door sill, car installation, or any operating equipment, such items are to be included by the elevator contractor.

C. The new allowance covering this car enclosure of a design and material shall include ventilation, lighting, doors, base, wainscoting, handrails, entrance columns, pad buttons and and transoms, as required and all necessary cutouts.

D. Provide one (1) complete set of protective pads for this elevator.

PART 3 - EXECUTION

3.1 OPERATION

A. Provide Elevator for "Simplex Collective" operation as follows:

1. The elevators shall operate from a single riser of pushbuttons with "call registered lights" at the landings. "Up" and "Down" pushbuttons shall be provided for the intermediate landings, and a single button at the terminal landings set in a flush mounted case.
2. Provide a key-operated switch for each elevator for selecting "Independent Service".
3. The operation of this elevator shall be such that the momentary pressing of one or more buttons shall send the car to the designated landings for which the buttons have been pressed in the order in which the landings are reached by the car, irrespective of the sequence in which buttons have been pressed and shall illuminate the proper car lantern.
4. A key-operated switch shall be provided in each car station and be marked "Independent Service" and shall operate as outlined herein. When this switch is thrown to the "Independent Service" position, it shall cancel all car calls for that car. Doors shall not close until a car button is pressed or until the key-operated switch is opened. Opening of the switch shall restore the car to normal operation.
5. Provide a solid state micro scan unit on each elevator. This system shall contain a minimum of 32 infrared beams strategically placed at intervals along the leading edge of the car doors, creating a detection screen in the elevator entrance. The micro scan unit shall be insensitive to dust, moisture and vibration and to be encased in an aluminum section. It shall close the doors, automatically, momentarily after the last entering or leaving passenger, and shall distinguish between stops made for a car call and stops made for corridor calls. The electronic device shall operate at both terminal and intermediate floors to prevent the car and hatchway doors from starting to close if a person or sizable object is in the doorway. It shall cause the doors to stop and reopen if, while closing, a person or object enters the doorway.
6. A time limit relay shall be provided, designed to hold the car at the landing at which it has stopped for an adjustable predetermined period of time, unless hoistway door is held open, before it will again start automatically in response to other calls.
7. An emergency stop switch shall be provided in each car to interrupt the power supply, ring a 6" diameter bell under the car platform and apply the brake independently of the regular operating device. The opening of the stop switch shall not cancel the registered calls and after this switch is again closed, the car shall continue to answer its calls. The emergency alarm bell shall be connected to the emergency stop switch.
8. All switches, except the emergency key switch, shall be key-operated and behind a keyed cover.
9. As required, operation of elevators under fire or other emergency conditions shall be provided in accordance with ANSI A17.1 Latest Edition, Rule No. 2.27.3.2. Also, the Contractor shall connect the existing smoke detector's into the new control system.

3.2 EMERGENCY AND SERVICE KEYS

A. Provision shall be made by this Section for Fire Department emergency keys, as required by Code.

B. Provide drop key access holes and ferrules in each door panel at every landing.

3.3 PAINTING

A. At the completion of the work, the machine room floor shall be “thoroughly cleaned” and shall receive one (1) coat of a quality deck enamel.

B. At the completion of work, the pit floor shall be “thoroughly cleaned” and shall receive one (1) coat of quality deck enamel.

3.4 ELECTRIC WIRING

A. Provide all wiring except trail cables in rigid standard weight or thin wall conduit with steel outlet boxes or wiring troughs, except that a small amount of flexible conduit may be used where not subject to moisture or imbedded in concrete.

B. Rigid conduit shall be galvanized and of the proper size to comply with the National Electric Code requirements. All wiring shall be installed in accordance with the National Electric Code and such local regulations that may apply.

C. Provide traveling cables between car and hatchway that shall be flexible and so hung to relieve strains in the copper conductors. Cables shall have the required number of shielded pairs for voice communication and coaxial cables for T.V. cameras. The shielded pairs for voice communication shall be terminated in the phone box in the cab and the coaxial cable for T.V. shall be terminated in a junction box on top of the cab and the elevator machine room and shall be properly tagged.

D. All wiring material used shall have flame retarding and moisture resisting outer covering and shall contain the label of approval of the Underwriters' Laboratories. Metal boxes, troughs and ducts shall be of a design to comply with the National Electric Code.

E. Interlock wiring shall comply with A17.1 codes.

3.5 PERMITS AND CERTIFICATES

A. Give necessary notices, file drawings and specifications with the departments having jurisdiction, obtain permits or licenses necessary to carry out this work and pay all fees therefore.

B. Arrange for inspection and tests, including Controlled Inspections, of any or all parts of the work if so required by authorities or utility companies having jurisdiction and pay all charges for same.

C. Pay all costs for and furnish to the Owner all certificates necessary as evidence that the work installed conforms with all regulations where they apply to this work.

3.6 TESTS

A. Include tests specified and/or required under laws, rules and regulations of all Departments having jurisdiction.

B. All parts of the work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition. Correct defects disclosed by these tests without any additional cost to the Brewster High School.

END OF SPECIFICATION

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 22 14 23
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.

B. Metal Downspout Nozzles: DS-1.

1. Jay R Smith
2. Description: Nozzle with wall flange and mounting holes to cover rough opening and serve as anchor.
3. Size: Same as connected downspout.
4. Material: Cast bronze or nickel bronze nozzle and flange.

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 230130

EXISTING HVAC AIR DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cleaning existing HVAC air-distribution equipment, ducts, plenums, and system components.

1.2 DEFINITIONS

A. ACAC: American Council for Accredited Certification.

B. AIHA-LAP: American Industrial Hygiene Association Lab Accreditation Program

C. ASCS: Air systems cleaning specialist.

D. CESB: Council of Engineering and Scientific Specialty Boards.

E. CMI: Certified Microbial Investigator.

F. CMC: Certified Microbial Consultant.

G. CMR: Certified Microbial Remediator.

H. CMRS: Certified Microbial Remediation Supervisor.

I. EMLAP: Environmental Microbiology Laboratory Accreditation Program.

J. IEP: Indoor Environmental Professional.

K. IICRC: Institute of Inspection, Cleaning, and Restoration Certification.

L. NADCA: National Air Duct Cleaners Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. ASCS Qualifications: A certified member of NADCA

1. Certification: Employ an ASCS certified by NADCA on a full-time basis
2. Supervisor Qualifications: Certified as an ASCS by NADCA

B. IEP Qualifications: CMI who is certified by ACAC and accredited by CESB.

C. IEP Qualifications: CMC who is certified by ACAC and accredited by CESB.

D. CMR Qualifications: Certified by ACAC and accredited by CESB.

E. CMRS Qualifications: Certified by ACAC and accredited by CESB.

PART 2 - PRODUCTS

2.1 HVAC CLEANING AGENTS

A. Description:

1. Formulated for each specific soiled coil condition that needs remedy.

2.2 ANTIMICROBIAL SURFACE TREATMENT

A. Description: Specific product selected shall be as recommended by the IEP based on the specific antimicrobial needs of the specific Project conditions.

1. Formulated to kill and inhibit growth of microorganisms.
2. EPA-registered for use in HVAC systems and for the specific application in which it will be used.
3. Have no residual action after drying, with zero VOC off-gassing.
4. OSHA compliant.
5. Treatment shall dry clear to allow continued visual observation of the treated surface.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspect HVAC air-distribution equipment, ducts, plenums, and system components to determine appropriate methods, tools, and equipment required for performance of the Work.

B. Cleaning Plan: Prepare a written plan for air-distribution system cleaning that includes strategies and step-by-step procedures.

C. Proceed with work only after conditions detrimental to performance of the Work have been corrected and cleaning plan has been approved.

D. Use the existing service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.

E. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning.

3.2 CLEANING

A. Comply with NADCA ACR.

B. Perform electrical lockout and tagout according to Owner's standards or authorities having jurisdiction.

C. Remove non-adhered substances and deposits from within the HVAC system.

D. Systems and Components to Be Cleaned: All air-moving and -distribution equipment.

E. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process.

1. Particulate Collection: For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.
2. HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger shall be used where the particulate collection equipment is exhausting inside the building,

F. Control odors and mist vapors during the cleaning and restoration process.

G. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.

H. System components shall be cleaned so that all HVAC system components are visibly clean. On completion, all components must be returned to those settings recorded just prior to cleaning operations.

I. Clean all air-distribution devices, registers, grilles, and diffusers.

J. Clean non-adhered substance deposits according to NADCA ACR and the following:

1. Clean air-handling units, airstream surfaces, components, condensate collectors, and drains.
2. Ensure that a suitable operative drainage system is in place prior to beginning wash-down procedures.
3. Clean evaporator coils, reheat coils, and other airstream components.

K. Air-Distribution Systems:

1. Create service openings in the HVAC system as necessary to accommodate cleaning.
2. Mechanically clean air-distribution systems specified to remove all visible contaminants, so that the systems are capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).

L. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.

M. Mechanical Cleaning Methodology:

1. Source-Removal Cleaning Methods: The HVAC system shall be cleaned using source-removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.

    a. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.
    b. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials, such as duct and plenum liners.

2. Cleaning Mineral-Fiber Insulation Components:

    a. Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR.
    b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).
    c. Fibrous materials that become wet shall be discarded and replaced.

N. Coil Cleaning:

1. See NADCA ACR, "Coil Surface Cleaning" Section. Type 1, or Type 1 and Type 2, cleaning methods shall be used to render the coil visibly clean and capable of passing coil cleaning verification.
2. Coil drain pans shall be subject to NADCA ACR, "Non-Porous Surfaces Cleaning Verification." Ensure that condensate drain pans are operational.
3. Electric-resistance coils shall be de-energized, locked out, and tagged before cleaning.
4. Cleaning methods shall not cause any appreciable damage to, cause displacement of, inhibit heat transfer, or cause erosion of the coil surface or fins, and shall comply with coil manufacturer's written recommendations.
5. Rinse thoroughly with clean water to remove any latent residues.

O. Application of Antimicrobial Treatment:

1. Apply antimicrobial agents and coatings if active fungal growth is determined by the IEP to be at Condition 2 or Condition 3 status according to IICRC S520, as analyzed by a laboratory accredited by AIHA-LAP with an EMLAP certificate and with results interpreted by an IEP. Apply antimicrobial agents and coatings according to manufacturer's written recommendations and EPA registration listing after the removal of surface deposits and debris.
2. Apply antimicrobial treatments and coatings after the system is rendered clean.
3. Apply antimicrobial agents and coatings directly onto surfaces of interior ductwork.
4. Microbial remediation shall be performed by a qualified CMR and CMRS.

3.3 CLEANLINESS VERIFICATION

A. Verify cleanliness according to NADCA ACR, "Verification of HVAC System Cleanliness" Section.

B. Surface-Cleaning Verification: Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

C. Verification of Coil Cleaning: Coil will be considered clean if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

D. Prepare a written cleanliness verification report.

3.4 RESTORATION

A. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR, "Restoration and Repair of Mechanical Systems" Section.

B. Restore service openings capable of future reopening. Comply with requirements in Section 233113 "Metal Ducts”.

C. Reseal fibrous-glass ducts. Comply with requirements in Section 233116 "Nonmetal Ducts."

D. Replace fibrous-glass materials that cannot be restored by cleaning or resurfacing. Comply with requirements in Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts."

E. Replace damaged insulation according to Section 230713 "Duct Insulation."

F. Ensure that closures do not hinder or alter airflow.

G. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.

H. Restore manual volume dampers and air-directional mechanical devices inside the system to their marked position on completion of cleaning.

END OF SECTION 230130

SECTION 23 0485

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 larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi 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 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 globe valves.
7. 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 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller.
4. Locking Lever Handle: For butterfly valves NPS 6 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 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.
c. CWP Rating: 600 psig.
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.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.

e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 IRON, SINGLE-FLANGE 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.
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.
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. Victaulic Corporation.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. Mueller Steam Specialty; a division of SPX Corporation.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
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. Victaulic Corporation.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. Mueller Steam Specialty; a division of SPX Corporation.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.

f. Stem: One- or two-piece stainless steel.
g. Disc: 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. Victualic Corporation.
b. Crane Co.; Crane Valve Group; Flowseal.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 285 psig at 100 deg F.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

B. Class 300, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Victaulic Corporation.
b. Crane Co.; Crane Valve Group; Flowseal.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 720 psig at 100 deg F.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, or ductile iron.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

2.5 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; Jenkins Valves.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-80, Type 4.
   b. CWP Rating: 300 psig.
   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; Jenkins Valves.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. Powell Valves.
   f. 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, CWP Rating: 200 psig.
   c. NPS 14 to NPS 24, CWP Rating: 150 psig.
   d. Body Design: Clear or full waterway.
   e. Body Material: ASTM A 126, gray iron with bolted bonnet.
   f. Ends: Flanged.
   g. Trim: Bronze.
   h. Gasket: Asbestos free.

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, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: 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. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. 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, CWP Rating: 500 psig.
c. NPS 14 to NPS 24, CWP Rating: 300 psig.
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.

2.7 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. Milwaukee Valve Company.
d. NIBCO INC.
e. Powell Valves.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.8 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. 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-85, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

B. Class 250, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, 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-85, Type I.
b. CWP Rating: 500 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

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 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 and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.5 VALVE APPLICATIONS

A. Heating-Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 and Larger: Lug Style 150-psigCWP rating, ferrous alloy, with EPDM liner.
6. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 150, bronze.
7. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, gray iron.
8. Wafer Check Valves, NPS 2-1/2 and Larger: Dual-plate, wafer, Class 125 or 150 ferrous alloy.
9. Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
10. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
11. Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
12. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 125, bronze-mounted cast iron.

B. Condenser hilled-Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 and Larger: Lug Style 150-psigCWP rating, ferrous alloy, with EPDM liner.
6. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 150, bronze.
7. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, gray iron.
8. Wafer Check Valves, NPS 2-1/2 and Larger: Dual-plate, wafer, Class 125 or 150 ferrous alloy.
9. Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
10. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
11. Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
12. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 125, bronze-mounted 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.

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.

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 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.

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 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 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.

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 at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

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 at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

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 at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
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.
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.
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.
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.
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-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 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-thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 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 when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 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, 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-thick, heat-bonded polyethylene and kraft paper.
c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

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-thick, heat-bonded polyethylene and kraft paper.
c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 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.

2.8 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.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 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.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

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.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive 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.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

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.
3. Film Thickness: 4 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

2.9 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 thick, 1/2 inch or 3/4 inch wide with wing or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch or 3/4 inch 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-] [0.135-inch-] 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-] [0.135-inch-] diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

   a. Products: Subject to compliance with requirements, 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 thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

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 thick by 1-1/2 inches in diameter.
   c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
   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 thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch-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 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 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-wide, stainless steel or Monel.

D. Wire: 0.062-inch 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.

2.10 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch 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 milsthick 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.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches4 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 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.

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.
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.

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. Heating hot 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 inches long by NPS 2.
2. Sheet Form Insulation Materials: 12 inches square.
3. Jacket Materials for Pipe: 12 inches long by NPS 2.
4. Sheet Jacket Materials: 12 inches square.

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 (3-m) section of NPS 2 (DN 50) 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 (DN 50) or smaller valve, and one NPS 2-1/2 (DN 65) 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.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products:

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, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied **FSK jacket** complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products:

a. CertainTeed Corp.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Manson Insulation Inc.; AK Flex.
e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products:

a. Ramco Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products:

a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products:]:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Adhesive, and FSK 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,

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 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).

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 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 (Minus 18 to plus 82 deg C).
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Joint Sealants for Polystyrene Products:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-70.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.

3. Materials shall be compatible with insulation materials, jackets, and substrates.

4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
6. Color: White or gray.
7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
8. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements,

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.
   e.

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.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
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 perm (0.013 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements,

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

6. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm (0.007 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

    a. Products:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

    a. Products:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements,

    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch or 3/4 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick 3/4 inch wide with wing seal 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. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless .

1. Manufacturers:

a. C & F Wire.

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 F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of 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. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (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. 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 (50 mm) 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 (150 mm) 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 (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. 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.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

E. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches (850 mm) or less. The 33-1/2-inch- (850-mm-) circumference limit allows for 2-inch- (50-mm-) overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.8 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.

3.9 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.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:
1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below:
1. NPS 1-1/4" and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe, Type I 1 inch
2. NPS 1- 1/2" and Larger: Insulation shall be the following:
   a. Mineral-Fiber Preformed Pipe, Type I, 1-1/2 inches.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:

1. None.
2. PVC: 20 mils thick.
3. Aluminum, Smooth : 0.020 inch thick.
4. Painted Aluminum, Smooth: 0.020 inch o r0.024 inch Stainless Steel, Type 304 or Type 316, Smooth 2B Finish.

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. During unoccupied periods, supply fan shall run only as required to maintain Unoccupied space temp setpoint. OA damper shall be closed and Energy recovery wheel shall be off.

C. Energy recovery wheel shall operate whenever outdoor air damper is open and unit is not in Economizer mode.

D. During a call for cooling (space temp above cooling setpoint), fan shall run, water control valve shall be open and factory controller shall stage compressors to maintain space temperature setpoint.

E. During a call for heat (space temp below heating setpoint), fan shall run, water control valve shall be open and factory controller shall stage compressors to maintain space temperature setpoint.

F. 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.

G. 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.

H. Smoke detected at duct-mounted smoke damper shall stop fan, close OA damper and send alarm signal to fire alarm control panel

1.3 VRF FAN COIL UNITS AND HEAT PUMPS

A. System shall operate such that all zones are in either heating or cooling mode. Cooling mode shall be automatically enabled at outdoor temps above 60F (adj.) or as selected at the operator's console. Heating mode shall be enabled at outdoor temps of 60F (adj.) and below, or as selected at operator's console.

B. DUCTED FAN COIL UNIT: Fan shall run continuously during occupied periods and OA damper shall be open to maintain slight positive pressure. During Unoccupied periods, fan shall run only as required to maintain unoccupied space temp setpoint; OA damper shall be closed.

C. CEILING CASSETTE FAN COIL UNIT: Supply fan shall run continuously during occupied periods. During Unoccupied periods, fan shall run only as required to maintain unoccupied space temp setpoint; OA damper shall be closed.

D. External supply fan (SF-1) shall run continuously during occupied periods and stop during unoccupied periods.

E. ll for cooling, factory controller shall stage compressors at heat pump to maintain space temperature setpoint.

F. During a call for heat (ie. below 68°F), factory controller shall stage compressors at heat pump to maintain space temperature setpoint.

G. 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.

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 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.

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 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 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.

2.10 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.

2.11 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 23 3423

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Inline 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.

2.5 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 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 237223.23

PACKAGED, OUTDOOR, HEAT WHEEL ENERGY RECOVERY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Heat wheels in packaged, outdoor, total energy-recovery units.

B. Related Requirements:

1. Section 237343.16 "Outdoor, Semi-Custom Air-Handling Units" for outdoor, semi-custom air-handling units if they also include coils, other than electric coils for frost control, in addition to heat wheels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For packaged, outdoor, heat-wheel, energy-recovery units.

1. Include plans, elevations, sections, details, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, lifting requirements, 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 packaged, outdoor, heat-wheel, energy-recovery units indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of heat-wheel, energy-recovery equipment.
2. Vibration-Isolation Roof Curb Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include rails and frames for equipment mounting.
3. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration-isolation roof curbs.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, roof plans, elevations, and other details, drawn to scale and coordinated with each other, using input from installers of items involved.

B. Seismic Qualification Data: Certificates, for packaged, outdoor, heat-wheel, energy-recovery units, accessories, and components, from manufacturer.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 COORDINATION

A. Coordinate sizes and locations of building openings and duct connections with actual equipment provided.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of packaged, outdoor, heat-wheel, energy-recovery units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy-Recovery Units: 3 years from date of Substantial Completion.
2. Warranty Period for Energy-Recovery Wheel: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Provide a product by one of the following listed manufacturers:

A. Trane Company.
B. Carrier Corp.
C. Daikin Corp.

2.2 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

B. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1.
2. Capacity ratings for heat-wheel, energy-recovery equipment: Comply with ASHRAE 84.

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

D. UL Compliance:

1. Packaged Heat-Recovery Ventilators: Comply with requirements in UL 1815.

E. Comply with ASTM E84.

F. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design vibration-isolation controls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.3 CAPACITIES AND CHARACTERISTICS

A. Refer to schedule on drawing sheets.

B. Filters:

1. Type: Pleated.
2. Maximum or Rated Face Velocity: 500 fpm.
3. Initial Resistance: 0.15”
4. Recommended Final Resistance: 0.25”

5. Minimum Efficiency Reporting Value:

a. MERV Rating: MERV 13 in accordance with ASHRAE 52.2.

2.4 PACKAGED, OUTDOOR, HEAT-WHEEL, ENERGY-RECOVERY UNITS

A. Source Limitations: Obtain packaged, outdoor, heat-wheel, energy-recovery units from single manufacturer.

B. Surfaces in Contact with Airstream: Comply with requirements in ASHRAE 62.1.

C. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, gasketed hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 2 inches thick,, thermal insulation, knockouts for electrical connections, exterior drain connection, and lifting lugs.

D. Heat Wheel:

1. Casing:

a. Manufacturer's standard construction with standard factory finish.
b. Slide-in, slide-out cassette style..
c. Provide unit with integral purge section with limited carryover of exhaust air.
d. Provide casing seals on periphery of rotor and on duct divider and purge section.
e. Support vertical rotors on grease-lubricated ball bearings having extended grease fittings with minimum L-50 of 200,000 hours. Support horizontal rotors on tapered roller bearing.

2. Rotor: Aluminum or polymer segmented wheel, strengthened with radial spokes.
3. Rotor: Aluminum or polymer segmented wheel, strengthened with radial spokes, with nontoxic, noncorrosive, silica-gel coating.
4. Rotor: Aluminum, metallic, or polymer segmented wheel, strengthened with radial spokes impregnated with nonmigrating, water-selective, four-angstrom, molecular-sieve desiccant coating.
5. Drive: Electric motor, with speed changed by variable-frequency motor controller and self-adjusting multilink belt around outside of rotor.

a. 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."
b. 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.

E. Supply and Exhaust Fans: Centrifugal, forward-curved backward-inclined fan with spring isolators of 1-inch static deflection.

1. Motor and Drive: Direct driven, with speed changed by variable-frequency motor controller.

a. 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."
b. Motor Sizes: Minimum size as indicated. If size is not indicated, provide motor large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Filters:

1. Particulate air filtration is specified in Section 234100 "Particulate Air Filtration."

G. Filters:

1. Description: pleated, factory-fabricated, self-supported, disposable air filters with holding frames.
2. UL Compliance: Comply with UL 900.
3. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
4. Filter Media Frame: Beverage board with perforated metal retainer or metal grid on outlet side.

5. Filter-Mounting Frames: Arranged with access doors or panels on one or both sides of unit. Design unit with filters removable from one side, or lift out from access plenum.

H. Wiring: Fabricate units with space within housing for electrical conduits. Wire motors and controls, so only external connections are required during installation.

1. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
2. Include nonfused disconnect switches.

2.5 CONTROLS

A. Control Panel: Solid-state, programmable, microprocessor-based control unit for wall mounting. Configured for BACnet protocol.

B. Starting relay, factory mounted and wired, and manual motor starter for field wiring.

C. Economizer Control, Stop Wheel: Stop wheel rotation or modulate wheel rotation speed when conditions are favorable for economizer operation.

D. Economizer Control, Airflow Bypass: Heat-wheel airflow bypass. See Section 230923 "Direct Digital Control (DDC) System for HVAC" for control sequence.

E. Enthalpy sensor.

F. Rotation sensor and alarm.

G. Dirty filter switch.

H. Low-Voltage Transformer: Integral transformer to provide control voltage to unit from primary incoming electrical service.

I. Electric Coil Controls:

1. Factory-mounted sensor in outside-air intake with sensor adjustment located in control panel to control electric coil and maintain minimum entering temperature, to avoid frost formation.

J. Variable-Frequency Motor Controller: Comply with Section 262923 "Variable-Frequency Motor Controllers."

K. Variable-Frequency Motor Controller: Serving wheel rotation motor.

1. Manufactured Units: Pulse-width modulated; constant torque for inverter-duty motors.
2. Output Rating: Three phase; 10 to 66 Hz, with torque constant as speed changes; maximum voltage equals input voltage.
3. Unit Operating Requirements:

a. Self-Protection and Reliability Features:

1) Surge suppression.
2) Loss of input signal protection.
3) Under- and overvoltage trips.
4) Variable-frequency motor controller and motor-overload/overtemperature protection.
5) Critical frequency rejection.
6) Loss-of-phase protection.
7) Reverse-phase protection.
8) Motor-overtemperature fault.

b. Bidirectional autospeed search.
c. Across the line Bypass.
d. Motor temperature compensation at slow speeds.

1) Panel-mounted operator station.
2) Historical logging information and displays.
3) Digital indicating devices.

e. Control Signal Interface: Electric.
f. Proportional integral derivative (PID) control interface.
g. DDC System for HVAC Protocols for Network Communications: ASHRAE 135.

4. Line Conditioning:

a. Input line conditioning.
b. Output filtering.
c. EMI/RFI filtering.

L. Variable-Speed Control: Factory mounted and wired, permitting input of field-connected, 4- to 20-mA or 1- to 10-V control signal.

M. Variable-Speed Control: Factory mounted and wired, with exhaust-air sensor to vary rotor speed and maintain exhaust temperature above freezing.

N. Variable-Speed Control: Factory mounted and wired, with exhaust- and outdoor-air sensors, automatic changeover thermostat, and set-point adjuster, to vary rotor speed and maintain air differential temperature above set point. Increase rotor speed to maximum when exhaust-air temperature is less than outdoor-air temperature.

2.6 SOURCE QUALITY CONTROL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended application.

B. AHRI Compliance: Capacity ratings for air-to-air energy-recovery equipment certified as complying with AHRI 1060 (IP).

C. Fan Performance Rating: Comply with AMCA 211, and label fans with AMCA-certified rating seal. Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency in accordance with AMCA 210 and ASHRAE 51.

D. Fan Sound Rating: Comply with AMCA 301 or AHRI 260 (IP).

E. UL Compliance:

1. Packaged Heat-Recovery Ventilators: Comply with requirements in UL 1812.
2. Electric Coils: Comply with UL 1995.

PART 3 - EXECUTION

3.1 INSTALLATION OF PACKAGED, OUTDOOR, HEAT-WHEEL, ENERGY-RECOVERY UNITS

A. Examine casing insulation materials and filter media before packaged, outdoor, heat wheel energy-recovery unit installation. Replace insulation materials and filter media that are wet, moisture damaged, or mold contaminated.

B. Install packaged, outdoor, heat-wheel, energy-recovery units, so supply and exhaust airstreams flow in opposite directions, and rotation is away from exhaust side to purge section to supply side.

1. Install access doors in both supply and exhaust ducts, both upstream and downstream, for access to wheel surfaces, drive motor, and seals.
2. Install removable panels or access doors between supply and exhaust ducts on building side for bypass during startup.
3. Access doors and panels are specified in Section 233300 "Air Duct Accessories."

C. Equipment Mounting:
1. Install roof-mounted packaged, outdoor, heat-wheel, energy-recovery units on manufacturer's-recommended-height equipment roof curbs. Comply with requirements for equipment curbs specified in Section 077200 "Roof Accessories."
2. Comply with requirements for vibration-isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

D. Install units with clearances for service and maintenance.

E. Do not operate equipment fans until temporary or permanent filters are in place. Replace temporary filters used during construction and testing with new, clean filters prior to final inspection.

3.2 DUCTWORK CONNECTIONS

A. Comply with requirements for ductwork in accordance with Section 233113 "Metal Ducts."

B. Connect duct to units with flexible connections. Comply with requirements in Section 233300 "Air Duct Accessories."

C. Isolation Dampers: Install isolation dampers in accordance with Section 230923.12 "Control Dampers."

3.3 PIPING CONNECTIONS

A. Comply with requirements for 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 unit, allow service and maintenance.

C. Connect piping to units mounted on vibration isolators with flexible connectors.

D. Condensate Drain Piping: See Section 232113 "Hydronic Piping" for pipe type. Install condensate drain piping from drain pans to nearest floor drain, same size as condensate drain connection.

1. Construct deep trap at connection to drain pan, and install cleanouts at changes in direction.

3.4 ELECTRICAL CONNECTIONS

A. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

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 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."

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 FIELD QUALITY CONTROL

A. Testing Agency: Engage qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Packaged, outdoor, heat-wheel, energy-recovery equipment will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 DEMONSTRATION

A. Engage factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy-recovery units.

END OF SECTION 237223.23

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, suspended, ceiling-mounted units.
3. Outdoor, air-source, heat pump units.
4. Heat recovery control units.
5. System controls.
6. System refrigerant and oil.
7. System condensate drain piping.
8. System refrigerant piping.
9. Metal hangers and supports.
10. Metal framing systems.
11. Fastener systems.
12. Equipment stands.
13. Miscellaneous support materials.
14. 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 [HRCU,]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 [20] 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 wind loads of governing code [and ASCE/SEI 7]
    b. Design equipment and supports to withstand snow and ice loads of governing code [and ASCE/SEI 7]
    c. 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. Seismic Performance: VRF HVAC system(s) shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7] .

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified [and the system will be fully operational after the seismic event]."
2. Component Importance Factor: [1.5]
3. Compliant Component Amplification Factor and Component Response Modification Factor shall be used.

K. Sound Performance: Sound levels generated by operating HVAC equipment shall be within requirements indicated.

1. Indoor: [See Drawings.] [Within design guidelines of "2015 ASHRAE HANDBOOK-HVAC Applications."]
2. Outdoor: [See Drawings] [Within ordinance of governing authorities] .

L. Thermal Movements: Allow for controlled thermal movements from ambient, surface, and system temperature changes.

M. Capacities and Characteristics: As indicated on Drawings.

2.4 INDOOR, CONCEALED, CEILING-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] [or] [painted] 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] [ASHRAE 52.2, MERV 11] [ASHRAE 52.2, MERV 13] .
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 [metal]raceways.

2.5 INDOOR, RECESSED, CEILING-MOUNTED UNITS

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: 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 [metal]raceways to comply with NFPA 70.

2.6 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.

2.7 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 [metal]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.

2.8 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.

2.9 SYSTEM CONTROLS

A. General Requirements:

1. Network: Indoor units[, HRCUs,] and outdoor units shall include integral controls and connect through a [TIA-485A] [or] [manufacturer-selected] control network.
2. Network Communication Protocol: [Manufacturer proprietary] [or] [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] [or] [Spanish]
10. Supports Imperial and Metric Temperature Units: [Fahrenheit] [or] [Celsius] [Fahrenheit and Celsius].
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] [or] [Spanish] .
5. Temperature Units: [Fahrenheit] [or] [Celsius] [Fahrenheit and Celsius].
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.

2.10 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.

2.11 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.

2.12 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.

2.13 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] [stainless 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] [stainless steel] .

2.14 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] [stainless steel, Type 304] [stainless steel, Type 316] [extruded-aluminum] 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: [No coating] [Electroplated zinc] [Hot-dip galvanized] [Gold (yellow zinc dichromate) galvanized].
8. Plastic Coating for Use Outdoors: [PVC] [polyurethane] [epoxy] [or] [polyester].

2.15 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] [or] [stainless] steel.
2. Outdoor Applications: Stainless steel.

2.16 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.

E. Wind/Sliding Load Resistance: Up to [100 mph].

2.17 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.

2.18 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.>

2.19 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 [6] [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.

2.20 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: [Immersion] [Spray].
3. Thickness: [1 mil].

4. Gloss: Minimum gloss of 60 on a 60-degree meter.

2.21 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 2 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 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.

3.5 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.

3.6 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."

3.7 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.

3.8 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.

3.9 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.

3.10 STARTUP SERVICE

A. Engage a VRF HVAC system manufacturer's service representative to perform system(s) startup service.

1. Service representative shall be [an employee] [or] [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 Owner and Commissioning Agent to witness startup service procedures.
2. Provide written notice not less than [20] business days before start of startup service.

3.11 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.

3.12 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.

3.13 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

END OF SECTION 238129

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 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 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 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 27 1000
STRUCTURED CABLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0519.13 - Undercarpet Electrical Power Cables: Flat cable and fittings for undercarpet communications distribution.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

1. Includes intersystem bonding termination.
2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.

D. Section 26 0536 - Cable Trays for Electrical Systems.

E. Section 26 0533.16 - Boxes for Electrical Systems.

F. Section 26 0539 - Underfloor Raceways for Electrical Systems.

G. Section 26 0553 - Identification for Electrical Systems: Identification products.

H. Section 26 2726 - Wiring Devices.

I. Section 27 0529 - Hangers and Supports for Communications Systems.

J. Section 27 0533.13 - Conduit for Communications Systems.

K. Section 33 7119 - Electrical Underground Ducts, Ductbanks, and Manholes.

1.3 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. FM (AG) - FM Approval Guide; current edition.

D. ICEA S-83-596 - Indoor Optical Fiber Cable; 2016.

E. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements; 2012.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).

H. TIA-492AAAA - Detail Specification for 62.5-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

I. TIA-492AAAB - Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009a.

J. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

K. TIA-492AAAD - Detail Specification for 850-nm Laser- Optimized, 50-?m Core Diameter/125-?m Cladding Diameter Class la Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber; 2009.

L. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers; 1998 (Reaffirmed 2002).

M. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak; 2000 (Reaffirmed 2005).

N. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant; 2015a.

O. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; Modification of IEC 61280-4-1 Edition 2, Fiber-Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant-Multimode Attenuation Measurement; 2015c.

P. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2020.

Q. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009c, with Addendum (2016).

R. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2016d.

S. TIA-569 - Telecommunications Pathways and Spaces; 2019e.

T. TIA-570 - Residential Telecommunications Infrastructure Standard; 2012c.

U. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).

V. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

W. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d.

X. UL (DIR) - Online Certifications Directory; Current Edition.

Y. UL 444 - Communications Cables; Current Edition, Including All Revisions.

Z. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

AA. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

AB. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Arrange for Communications Service Provider to provide service.

C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Sustainable Design Documentation: Submit manufacturer's product data on cable and cable insulation showing compliance with specified lead content requirements.

D. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

E. Evidence of qualifications for installer.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

G. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

H. Field Test Reports.

I. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on drawings.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.6 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
   2. Supervisors and installers factory certified by manufacturers of products to be installed.
   3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

PART 2 PRODUCTS

2.1 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. Comply with Communications Service Provider requirements.
2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
3. 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.
4. 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. System Description:
1. Building Entrance Cable: By others.
2. Backbones - Within Building: Copper, ____-pair.
3. Backbones - Between Buildings: Copper, ____-pair.
4. Offices and Work Areas: Provide one voice outlet and one data outlet in each work area.
5. Classrooms: _____.
6. Computer Lab: _____.
7. _____: _____.
8. _____: _____.
9. _____: _____.
10. Provide additional outlets where indicated on drawings.

C. 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. For the entire campus there is one main distribution frame and for each building there is a building distribution frame (BDF) that functions as the main distribution frame (MDF) for that building.
2. Locate main distribution frame as indicated on the drawings.
3. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
1. Locate intermediate distribution frames as indicated on the drawings.

E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.2 PATHWAYS

A. Conduit: See section 27 0533.13.

B. Cable Trays: See Section 26 0536.

C. Underfloor Ducts: See Section 26 0539.

D. Overhead Service Entrance: Weatherhead or service entrance fitting located on outside of building with galvanized rigid steel or intermediate metallic conduit running to entrance facility.

E. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
1. Products:
a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
b. _____.
c. Substitutions: See Section 01 6000 - Product Requirements.

2.3 COPPER CABLE AND TERMINATIONS

A. Manufacturers:
   1. CommScope; _____: www.commscope.com/#sle.
   2. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
   3. Siemon Company; _____: www.siemon.com/#sle.
   4. _____.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Copper Backbone Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
   2. Cable Type: TIA-568.2 Category 3 UTP (unshielded twisted pair); 24 AWG.
   3. Cable Capacity: Quantity of pairs as indicated on drawings.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
      b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
   5. Product(s):
      a. _____.

C. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   3. Cable Capacity: 4-pair.
   4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
   5. Cable Jacket Color - Voice and Data Cable: Blue.
   6. Product(s):
      a. CommScope; SYSTIMAX Twisted Pair Cables; GigaSPEED XL Category 6 U/UTP Cable: www.commscope.com/#sle.
      b. CommScope; Uniprise Twisted Pair Cables; CS34 Series Category 6 U/UTP Cable: www.commscope.com/#sle.
      c. General Cable Technologies Corporation; GenSPEED Cables: www.generalcable.com/#sle.
      d. _____.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

E. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
   1. Performance: 500 mating cycles.
   2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
   3. Product(s):
      a. CommScope; SYSTIMAX RJ45 Jacks; MGS400 Series Category 6 U/UTP Modular Jacks: www.commscope.com/#sle.
      b. CommScope; Uniprise RJ45 Jacks; UNJ600 Series Category 6 U/UTP Modular Jacks: www.commscope.com/#sle.
      c. _____.

F. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
a. Quantity: One for each pair of patch panel ports.
b. Length: _____ feet (_____ mm).
3. Patch Cords for Work Areas:
a. Quantity: One for each work area outlet port.
b. Length: _____ feet (_____ mm).
4. Product(s):
a. CommScope; SYSTIMAX Category 6 U/UTP Patch Cords: www.commscope.com/#sle.
b. CommScope; Uniprise Category 6 U/UTP Patch Cords: www.commscope.com/#sle.
c. _____.

2.4 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Manufacturers:
1. CommScope; _____: www.commscope.com/#sle.
2. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
3. Siemon Company; _____: www.siemon.com/#sle.
4. _____.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Fiber Optic Backbone Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
3. Cable Capacity: Quantity of fibers as indicated on drawings.
4. Cable Applications:
a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
5. Cable Jacket Color:
a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
b. Multimode Fiber (OM1/OM2): Orange.
c. Single-Mode Fiber (OS1/OS2): Yellow.
6. Product(s):
a. CommScope Fiber Optic Cables; TeraSpeed Zero Water Peak Single-Mode Fiber: www.commscope.com/#sle.
b. _____.

C. Fiber Optic Horizontal Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
3. Cable Capacity: 2-fiber.
4. Cable Applications: Use listed NFPA 70 Type OFNP plenum cable unless otherwise indicated.

D. Fiber Optic Interconnecting Devices:
1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.

3. Maximum Attenuation/Insertion Loss: 0.3 dB.
4. Product(s):
   a. CommScope Fiber Optic Connectors; QWIK II-LC Fiber Connectors: www.commscope.com/#sle.
   b. _____.

E. Fiber Optic Patch Cords:
1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.
2. Patch Cords for Patch Panels:
   a. Quantity: One for each pair of patch panel ports.
   b. Length: _____ feet (_____ mm).
3. Patch Cords for Work Areas:
   a. Quantity: One for each work area outlet port.
   b. Length: _____ feet (_____ mm).
4. Product(s):
   a. CommScope Fiber Optic Patch Cords; TeraSpeed Fiber Patch Cords: www.commscope.com/#sle.
   b. _____.

2.5 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
1. Manufacturers:
   a. CommScope; _____: www.commscope.com/#sle.
   b. Siemon Company; _____: www.siemon.com/#sle.
   c. _____.
   d. _____.
   e. Substitutions: See Section 01 6000 - Product Requirements.
2. Connector Blocks for Category 3 Cabling: Type 66 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
3. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
4. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
   a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
   b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
   c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
   d. Provide incoming cable strain relief and routing guides on back of panel.
5. Product(s):
   a. CommScope; SYSTIMAX Copper Panels; 360-IPR-1100-XX Series Patch Panels: www.commscope.com/#sle.
   b. CommScope; Uniprise Copper Panels; UNP-XX-DM Series Patch Panels: www.commscope.com/#sle.
   c. _____.

B. Fiber Optic Cross-Connection Equipment:
1. Manufacturers:
   a. CommScope; _____: www.commscope.com/#sle.

b. Siemon Company; _____: www.siemon.com/#sle.
c. _____.
d. _____.
e. Substitutions: See Section 01 6000 - Product Requirements.

2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
c. Provide incoming cable strain relief and routing guides on back of panel.
d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
e. Provide dust covers for unused adapters.

3. Product(s):
a. CommScope; SYSTIMAX Fiber Panels; HD Series Patch Panels: www.commscope.com/#sle.
b. CommScope; Uniprise Fiber Panels; SD Series Patch Panels: www.commscope.com/#sle.
c. _____.

C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
1. Size: As indicated on drawings.
2. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:
1. Manufacturers:
a. CommScope; _____: www.commscope.com/#sle.
b. Siemon Company; _____: www.siemon.com/#sle.
c. _____.
d. _____.
e. Substitutions: See Section 01 6000 - Product Requirements.

2. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
3. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
a. Load Rating: _____ pounds (_____ kg).

4. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
a. Load Rating: _____ pounds (_____ kg).

5. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.
a. Load Rating: _____ pounds (_____ kg).
b. Roof mounted fan, capacity _____.

6. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
a. Cover inside of cabinet back with plywood backboard as specified.
b. Load Rating: _____ pounds (_____ kg).
c. Roof mounted fan, capacity _____.
d. Duplex AC power outlet inside cabinet.

7. Cabinets: Steel construction with corrosion resistant finish.
8. Locks: Keyed alike.
9. Product(s):

a. CommScope Two-Post Equipment Racks (Relay Racks) ; www.commscope.com/#sle.
b. _____.

E. Cable Management:
1. Manufacturers:
a. CommScope; _____: www.commscope.com/#sle.
b. Siemon Company; _____: www.siemon.com/#sle.
c. _____.
d. _____.
e. Substitutions: See Section 01 6000 - Product Requirements.
2. Product(s):
a. CommScope Cable Runway: www.commscope.com/#sle.
b. CommScope Horizontal/Vertical Cable Managers; HCM-SS-XX-XX/VCM-DS-XX-XX Series: www.commscope.com/#sle.
c. CommScope FiberGuide Raceway: www.commscope.com/#sle.
d. _____.

2.6 COMMUNICATIONS OUTLETS

A. Manufacturers:
1. CommScope; _____: www.commscope.com/#sle.
2. Siemon Company; _____: www.siemon.com/#sle.
3. _____.
4. _____.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Outlet Boxes: Comply with Section 26 0533.16.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
a. Voice Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.
b. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
c. Fiber Optic Outlets: 4-11/16 inch square by 2-1/8 inch deep (119 by 54 mm) trade size.

C. Wall Plates:
1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
a. Voice Only Outlets: _____ ports.
b. Data or Combination Voice/Data Outlets: _____ ports.
c. Fiber Optic Outlets: _____ simplex/_____ duplex couplers.
4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 2726.
5. Product(s):
a. CommScope Faceplates; M Series: www.commscope.com/#sle.
b. _____.

2.7 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

B. Comply with Section 26 0526.

2.8 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

B. Comply with Section 26 0553.

2.9 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

3.2 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches (300 mm) from power conduits and cables and panelboards.
   3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
   4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.

B. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

C. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of telecommunications outlets provided under this section.
      a. Mounting Heights: Unless otherwise indicated, as follows:
         a) Telephone and Data Outlets: 18 inches (450 mm) above finished floor.
         b) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 54 inches (1.4 m) above finished floor to top of telephone.
         c) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches (1.2 m) above finished floor to top of telephone.
         d) _____.
      b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
      c. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
      d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
      e. Locate outlet boxes so that wall plate does not span different building finishes.
      f. Locate outlet boxes so that wall plate does not cross masonry joints.
      g. _____.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.

2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches (3000 mm).
2. At Outlets - Copper: 12 inches (305 mm).
3. At Outlets - Optical Fiber: 39 inches (1000 mm).

C. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
3. Use T568B wiring configuration.

D. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

E. Wall-Mounted Racks and Enclosures:
1. Install to plywood backboards only, unless otherwise indicated.
2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

G. Floor-Mounted Enclosures: Connect adjacent cabinets together and remove interior side panels.

H. Identification:
1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.
4. Inspect patch cords for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
1. Test backbone cables after termination but before cross-connection.
2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
3. Test operation of shorting bars in connection blocks.
4. Category 3 Backbone: Perform attenuation test.
5. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.

6. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
7. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Testing - Fiber Optic Cabling:
1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
2. Multimode Backbone: Perform tests in accordance with TIA-526-14.
3. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
4. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 28 4621.11

ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Existing fire-alarm system to be modified.
2. Addressable fire-alarm system.
3. Manual fire-alarm boxes.
4. System smoke detectors.
5. Duct smoke detectors.
6. Carbon monoxide detectors.
7. Fire-alarm notification appliances.
8. Fire-alarm remote annunciators.
9. Fire-alarm addressable interface devices.
10. Digital alarm communicator transmitters (DACTs).

B. Related Requirements:

1. Section 08 7100 "Door Hardware" for magnetic door holders that release in response to fire-alarm outputs.
2. Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables" for cables and conductors for fire-alarm systems.

1.2 DEFINITIONS

A. DACT: Digital alarm communicator transmitter.

B. FACU: Fire-alarm control unit.

C. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

1.3 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 "Documentation" section of "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, and details, including details of 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. Annunciator panel details as required by authorities having jurisdiction.
5. Detail assembly and support requirements.
6. Include voltage drop calculations for notification-appliance circuits.
7. Include battery-size calculations.
8. Include input/output matrix.
9. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.

1.4 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 01 7823 "Operation and Maintenance Data," include the following:

    a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
    b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
    c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
    d. Riser diagram.
    e. Device addresses.
    f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
    g. Record copy of site-specific software.
    h. Provide "Inspection and Testing Form" in accordance with "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.

    i. Manufacturer's required maintenance related to system warranty requirements.
    j. Abbreviated operating instructions for mounting at FACU and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media and approved online or cloud solution.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
2. Installation must be by personnel certified by NICET as fire-alarm Level II technician.
3. Obtain certification by NRTL in accordance with NFPA 72.
4. Licensed or certified by authorities having jurisdiction.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXISTING FIRE-ALARM SYSTEM TO BE MODIFIED

A. Basis for Pricing: Edwards Est.

B. Source Limitations for Fire-Alarm System and Components: Components must be compatible with, and operate as extension of, existing system. Provide system manufacturer's certification that components provided have been tested as, and will operate as, a system.

2.2 ADDRESSABLE FIRE-ALARM SYSTEM

A. Description:

1. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice-and-strobe notification for evacuation.

B. Performance Criteria:

1. Regulatory Requirements:

a. Fire-Alarm Components, Devices, and Accessories: Listed and labeled by a NRTL in accordance with NFPA 70 for use with selected fire-alarm system and marked for intended location and application.

2. General Characteristics:
   a. Fire-alarm signal initiation must be by one or more of the following devices and systems:

      1) Manual stations.
      2) Heat detectors.
      3) Flame detectors.
      4) Smoke detectors.
      5) Duct smoke detectors.
      6) Carbon monoxide detectors.
      7) Fire-extinguishing system operation.

   b. Fire-alarm signal must initiate the following actions:

      1) Continuously operate alarm notification appliances, including voice evacuation notices.
      2) Identify alarm and specific initiating device at FACU, connected network control panels, off-premises network control panels, and remote annunciators.
      3) Transmit alarm signal to remote alarm receiving station.
      4) Unlock electric door locks in designated egress paths.
      5) Release fire and smoke doors held open by magnetic door holders.
      6) Activate voice/alarm communication system.
      7) Switch HVAC equipment controls to fire-alarm mode.
      8) Close smoke dampers in air ducts of designated air-conditioning duct systems.
      9) Activate emergency shutoffs for gas and fuel supplies, except for shutoffs serving legally required life-safety systems such as emergency generators and fire pumps.
      10) Record events in system memory.
      11) Record events by system printer.

   c. Supervisory signal initiation must be by one or more of the following devices and actions:

      1) Valve supervisory switch.
      2) High- or low-air-pressure switch of dry-pipe or preaction sprinkler system.
      3) Zones or individual devices have been disabled.
      4) FACU has lost communication with network.

   d. System trouble signal initiation must 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 addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
      4) Loss of primary power at FACU.
      5) Ground or single break in internal circuits of FACU.
      6) Abnormal ac voltage at FACU.
      7) Break in standby battery circuitry.
      8) Failure of battery charging.

9) Abnormal position of switch at FACU or annunciator.
10) Voice signal amplifier failure.

e. System Supervisory Signal Actions:

1) Initiate notification appliances.
2) Identify specific device initiating event at FACU, connected network control panels, off-premises network control panels, and remote annunciators.
3) Record event on system printer.
4) After time delay of 200 seconds, transmit trouble or supervisory signal to remote alarm receiving station.
5) Transmit system status to building management system.
6) Display system status on graphic annunciator.

f. Device Guards:

1) Description: Welded wire mesh of size and shape for manual station, smoke detector, gong, or other device requiring protection.

a) Factory fabricated and furnished by device manufacturer.
b) Finish: Paint of color to match protected device.

g. Document Storage Box:

1) Description: Enclosure to accommodate standard 8-1/2-by-11 inch manuals and loose document records. Legend sheet will be permanently attached to door for system required documentation, key contacts, and system information. Provide two key ring holders with location to mount standard business cards for key contact personnel.
2) Material and Finish: 18-gauge cold-rolled steel; four mounting holes.
3) Color: Red powder-coat epoxy finish.
4) Labeling: Permanently screened with 1 inch high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.
5) Security: Locked with 3/4 inch barrel lock. Provide solid 12 inch stainless steel piano hinge.

2.3 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes must be finished in red with molded, raised-letter operating instructions in contrasting color; must show visible indication of operation; and must 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 alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to FACU.
2. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at top to permit lifting for access to initiate alarm.
3. Able to perform at up to 90 percent relative humidity at 90 deg F.
4. Material: Manual stations made of Lexan polycarbonate.
5. Able to be used in indoor areas.

2.4 SYSTEM SMOKE DETECTORS

A. Photoelectric Smoke Detectors:
1. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 268.

b. General Characteristics:

1) Detectors must be two-wire type.
2) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
3) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in 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.
6) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
7) Operator at FACU, having designated access level, must 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.).

8) Detector must have functional humidity range within 10 to 90 percent relative humidity.
9) Color: White.
10) Remote Control: Unless otherwise indicated, detectors must be digital-addressable type, individually monitored at FACU for calibration, sensitivity, and alarm condition.
11) Rate-of-rise temperature characteristic of combination smoke- and heat-detection units must be selectable at FACU for 15 or 20 deg F per minute.
12) Fixed-temperature sensing characteristic of combination smoke- and heat-detection units must be independent of rate-of-rise sensing and must be settable at FACU to operate at 135 or 155 deg F.
13) Multiple levels of detection sensitivity for each sensor.
14) Sensitivity levels based on time of day.

2.5 DUCT SMOKE DETECTORS

A. Description: Photoelectric-type, duct-mounted smoke detector.

B. Performance Criteria:

1. Regulatory Requirements:

    a. NFPA 72.
    b. UL 268A.

2. General Characteristics:

    a. Detectors must be two-wire type.
    b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
    c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
    d. Integral Visual-Indicating Light: LED type, indicating detector has operated.
    e. Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
    f. Operator at FACU, having designated access level, must 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.).

    g. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with supplied detector for smoke detection in HVAC system ducts.
    h. Each sensor must have multiple levels of detection sensitivity.
    i. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
    j. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.6 CARBON MONOXIDE DETECTORS

A. Description: Carbon monoxide detector listed for connection to fire-alarm system.

B. Performance Criteria:

1. Regulatory Requirements:

    a. NFPA 72
    b. NFPA 720.
    c. UL 2075.

2. General Characteristics:

    a. Mounting: Adapter plate for outlet box mounting.
    b. Testable by introducing test carbon monoxide into sensing cell.
    c. Detector must provide alarm contacts and trouble contacts.
    d. Detector must send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
    e. Locate, mount, and wire in accordance with manufacturer's written instructions.

f. Provide means for addressable connection to fire-alarm system.
g. Test button simulates alarm condition.

2.7 HEAT DETECTORS

A. Combination-Type Heat Detectors:
1. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 521.

b. General Characteristics:

1) Temperature sensors must test for and communicate sensitivity range of device.

c. Actuated by fixed temperature of 135 deg F or rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
d. Mounting: Twist-lock base interchangeable with smoke-detector bases.
e. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
f. Detector must have functional humidity range of 10 to 90 percent relative humidity.
g. Color: White.

B. Fixed-Temperature-Type Heat Detectors:
1. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 521.

b. General Characteristics:

1) Actuated by temperature that exceeds fixed temperature of 190 deg F.
2) Mounting: Twist-lock base interchangeable with smoke-detector bases.
3) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
4) Detector must have functional humidity range of 10 to 90 percent.
5) Color: White.

2.8 MULTICRITERIA AND MULTISENSOR FIRE DETECTORS

A. Description: Fire-sensing detectors using multiple means of detection.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Mounting: Twist-lock base interchangeable with smoke-detector bases.
b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
c. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. Detector must send trouble alarm if it is incapable of compensating for existing conditions.
d. Test button tests sensors in detector.
e. Operator at FACU, having designated access level, must be able to manually access the following for each detector:

1) Primary status.
2) Device type.
3) Present sensitivity selected.
4) Sensor range (normal, dirty, etc.).

f. Detector must have functional humidity range within 10 to 90 percent relative humidity.
g. Color: White.
h. Comply with UL requirements.
i. Sensors (Multisensor Type): Detector must be comprised of four sensing elements including smoke sensor, carbon monoxide sensor, infrared sensor, and heat sensor.

1) Smoke sensor must be photoelectric type as described in "System Smoke Detectors" Article.
2) Carbon monoxide sensor must be as described in "Carbon Monoxide Detectors" Article.
3) Heat sensor must be as described in "Heat Detectors" Article.
4) Each sensor must be separately listed in accordance with requirements for its detector type.

2.9 FIRE-ALARM NOTIFICATION APPLIANCES

A. Fire-Alarm Audible Notification Appliances:
1. Description: Horns, bells, or other notification devices that cannot output voice messages.
2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.

b. General Characteristics:

1) Individually addressed, connected to signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.
2) Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
3) Sounders, High Volume 24 V(dc): Less than 6 mA of alarm current.
4) Sounders, Low Volume 24 V(dc): Less than 4 mA of alarm current.

5) Audible notification appliances must have functional humidity range of 10 to 95 percent relative humidity.
6) ISO Temporal 3 Evacuation Tone: 90 plus or minus 4 dB(A-weighted) at 24 V.
7) ISO Temporal 3 Alert Tone: 95 plus or minus 5 dB(A-weighted) at 24 V.
8) AS2220 Evacuation Tone: 93 plus or minus 4 dB(A-weighted) at 24 V.
9) AS2220 Alert Tone: 93 plus or minus 5 dB(A-weighted) at 24 V.
10) Horns: Electric-vibrating-polarized type, 24 V(dc); with provision for housing operating mechanism behind grille. Comply with UL 464. Horns must produce sound-pressure level of 90 dB(A-weighted), measured 10 ft. from horn, using coded signal prescribed in UL 464 test protocol.
11) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Fire-Alarm Voice/Tone Notification Appliances:
1. Description: Notification appliances capable of outputting voice evacuation messages.
2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 1480.

b. General Characteristics:

1) Speakers for Voice Notification: Locate speakers for voice notification to provide intelligibility requirements of "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
2) High-Range Units: Rated 2 to 15 W.
3) Low-Range Units: Rated 1 to 2 W.
4) Mounting: Flush.
5) Matching Transformers: Tap range matched to acoustical environment of speaker location.
6) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

C. Fire-Alarm Visible Notification Appliances:
1. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 1971.

b. General Characteristics:

1) Rated Light Output:
a) 15/30/75/110 cd, selectable in field.

2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
3) Mounting: Wall mounted unless otherwise indicated.

4) For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
5) Flashing must be in temporal pattern, synchronized with other units.
6) Strobe Leads: Factory connected to screw terminals.
7) Mounting Faceplate: Factory finished, white.

2.10 FIRE-ALARM REMOTE ANNUNCIATORS

A. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Annunciator functions must match those of FACU for alarm, supervisory, and trouble indications. Manual switching functions must match those of FACU, including acknowledging, silencing, resetting, and testing.

1) Mounting: Flush cabinet, NEMA 250, Type 1.

b. Display Type and Functional Performance: Alphanumeric display and LED indicating lights must match those of FACU. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.11 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

A. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Include address-setting means on module.
b. Store internal identifying code for control panel use to identify module type.
c. Listed for controlling HVAC fan motor controllers.
d. Monitor Module: Microelectronic module providing system address for alarm-initiating devices for wired applications with normally open contacts.

e. 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 PREPARATION

A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document 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 in accordance with 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. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

3.3 INSTALLATION OF EQUIPMENT

A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install 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 other trades have completed cleanup must be replaced.
2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with 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 building.
2. Connect new equipment to existing monitoring equipment at supervising station.

3. Expand, modify, and supplement existing control equipment as necessary to extend existing control functions to new points. New components must be capable of merging with existing configuration without degrading performance of either system.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inch above finished floor.

D. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in normal path of egress within 60 inch of exit doorway.
2. Mount manual fire-alarm box on background of contrasting color.
3. Operable part of manual fire-alarm box must be between 42 and 48 inch above floor level. Devices must be mounted at same height unless otherwise indicated.

E. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend full width of duct. Tubes more than 36 inch long must be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

G. Remote Status and Alarm Indicators: Install in 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 inch below ceiling. Install bells and horns on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inch below ceiling. Install devices at same height unless otherwise indicated.

J. Device Location-Indicating Lights: Locate in public space near device they monitor.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 26 0526 "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 must be laminated acrylic or melamine plastic signs with 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. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

3.6 PATHWAYS

A. Pathways above recessed ceilings and in inaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inch above floor must be installed in EMT.

B. Exposed EMT must be painted red enamel.

3.7 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 08 7100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with supervised interface device to the following devices and systems. Install interface device less than 36 inch from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.
1. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
2. Magnetically held-open doors.
3. Electronically locked doors and access gates.
4. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
5. Supervisory connections at valve supervisory switches.
6. Data communication circuits for connection to building management system.

3.8 IDENTIFICATION

A. Install framed instructions in location visible from FACU.

3.9 GROUNDING

A. Ground FACU and associated circuits in accordance with Section 26 0526 "Grounding and Bonding for Electrical Systems."

B. Ground shielded cables at control panel location only. Insulate shield at device location.

3.10 FIELD QUALITY CONTROL

A. Field tests must be witnessed by Architect.

B. Administrant for Tests and Inspections:

1. Owner will engage qualified testing agency to administer and perform tests and inspections.
2. Engage qualified testing agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.

2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Test audible appliances for public operating mode in accordance with manufacturer's written instructions. Perform test using portable sound-level meter complying with Type 2 requirements in ASA S1.4 Part 1/IEC 61672-1.
4. Test visible appliances for public operating mode in accordance with manufacturer's written instructions.
5. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. 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.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. Provide video recording of training to Owner.

END OF SECTION

SITE CLEARING

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

RESILIENT SURFACING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide labor, materials, equipment, services required to install resilient surfacing and related work as indicated on the Drawings and as specified herein, including by not limited to:

1. Resilient Surfacing

a. Running Track

b. Pole Vault/Long Jump

c. High Jump

d. Javelin Runway

2. Accessories

a. Vaulting Box

b. Take-off Boards

1.2 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. ASTM International (ASTM).

C. IAAF (International Association of Athletes Federation)

D. NFHS ()

1.3 SUSTAINABILITY REQUIREMENTS

A. Resilient surfacing shall have a three year aged solar reflectance (SR) of a minimum of 0.28 or an initial Solar Reflectance (SR) of at least 0.33 as documented by ASTM Standards E903.

1.4 SUBMITTALS

A. Product Data

Provide manufacturers' information and installation instructions for the following:

1. Resilient surfacing

2. Vaulting Box

3. Take-off board

B. Samples

Submit full thickness 12" x 12" sample of resilient surfacing material in selected color.

C. Guarantee

D. Sustainability Submittals

Submit documentation of initial or 3-year SR values for resilient surface.

1.5 QUALIFICATIONS

A. Company specializing in the Work of this Section shall have a minimum of 3 years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package rubber in heavy-duty polyethylene bags to protect from moisture during transportation and handling.

B. Protect containers containing polyurethane and resins from the elements and from extreme temperatures.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install resilient surfacing when there is water or frost on the asphaltic concrete base or when the air temperature is 40ºF or below.

1.8 GUARANTEE

A. Provide a written guarantee covering all workmanship and materials for a period of 5 years from the date of final acceptance.

PART 2 - PRODUCTS

2.1 DISTRIBUTORS AND MANUFACTURER'S

A. Resilient Surfacing

1. California Sport Surfaces Andover, MA

2. Beynon Sport Surfaces

3. Manufacturers of equivalent resilient surfacing systems conforming to requirements specified herein.

B. Accessories

1. Gill Athletics, Champaign, IL 61820

2. Sportsfield Specialties, Dehli, NY 13753

2.2 MATERIALS

A. Resilient Surfacing

1. General

a. Resilient, synthetic rubber surfacing comprised of binders and cryogenically processed styrene-butadiene rubber (SBR) and ethylene-propylene-diene monomer (EPDM) rubber granules installed over an asphaltic concrete base (plant mix and topping).

b. Thickness shall be approximately 1/2" (minimum 13mm).

c. Resilient surfacing shall be a system conforming to requirements specified herein.

d. The resilient surfacing shall comply with the minimum requirements given for the properties listed:

Density	1.1
Shore A Hardness @ 70ºF (ASTM D2240)	50-65
Resiliency @ 77ºF (ASTM D2632)	35
Force reduction	35-50%
Modified vertical deformation	0.6 – 1.8 mm
Coefficient of friction	> 47 TRRL
Tensile Strength (ASTM D412)	300 psi

2. Rubber Granules

a. Black SBR - The rubber granules for the base mat/cushion course shall be recycled SBR rubber having nominal specific gravity of 1.15, cryogenically processed and chopped to 1-3mm size containing less than 4% dust.

b. EPDM The rubber granules for the, structural wearing layer shall be EPDM peroxide cured, man-made rubber granules having a nominal specific gravity of 1.5+0.5, cryogenically processed and chopped to 1-3mm. Green in Color.

3. Resin/Binder - Manufacturer's resin for the base and wearing layers. Specifically formulated for compatibility with SBR and EPDM granules. Color Green.

4. Seal Coat- Two component polyurethan pore sealer use with paved rubber granule mats. The granular SBR and binder layer shall be sealed. The application of EPDM dust in not allowed.

5. Line Marking Paint - Single-component, moisture cured, aliphatic polyurethane paint.

B. Vaulting Box

Aluminum vaulting box and cover with resilient surfacing, Gill Athletics items 502 and 50201.

C. Take-off Boards

Official High School Long Jump Take-Off Board and conversion board No. 441C**,** seal treated wood finished in white outdoor enamel, Gill Athletics**.**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to application of the resilient surfacing, inspect the asphaltic concrete base for conformity to planarity requirements. The surface shall not deviate more than 1/8" in 10 feet from the specified grade when checked with a 10-foot straightedge. Flood the paving with water to determine if any ponds exist. Do not place resilient surfacing until the areas which do not meet the above requirements have been repaired to the satisfaction of the Authority and the resilient surfacing manufacturer and installer.

3.2 PREPARATION

A. Protection

Protect adjacent surfaces from the resin and overspray during application.

B. Surface Preparation

1. Allow the asphaltic concrete base to cure and the oils to dissipate to a degree acceptable to the manufacturer (a minimum of 14 days) prior to commencement of the resilient surfacing procedure.

2. Clean the area to be surfaced of any loose or foreign particles (dirt, oil and other contaminants) prior to commencement of the Work.

3.3 INSTALLATION OF RESILIENT SURFACING

A. Cushion Course/force reduction layer Application

1. For latex based systems apply the blended structural resin/binder and the SBR rubber granules in multiple layers at a rate specified by the manufacturer.

2. For polyurethane systems apply the blended structural resin/binder and the SBR rubber granules in a single layer at a rate specified by the manufacturer.

3. Total minimum thickness: 8 mm

B. Structural/Resilient Wearing layer application

1. On completion of the cushion/force reduction layer course, apply coat of structural wearing layer with resin integrated with EPDM granuales over the cured cushion course at the rate specified by the manufacturer.

2. Minimum thickness: 5 mm.

C. Structural wearing top coat application (where recommended by manufacturer)
After the structural/resilient layer has cured, apply two applications of the Structural Spray Wearing Coat as follows:

a. Apply material using approved air-spray equipment.

b. Apply at a rate of 0.10 g/yd^2 for each application.

D. Comply with manufacturer's published standard or updated instructions for installation.

E. Coordinate the work with line painting, to be applied after surface has completely cured.

3.4 VAULT BOX

A. Concrete foundation shall have been installed prior to placement of asphaltic concrete base.

B. Fit vaulting box to foundation with cover flush with resilient surface.

3.5 TAKE OFF BOARDS

A. Install take-off boards for long jump flush with resilient surfacing.

3.6 FIELD QUALITY CONTROL

A. Testing and Inspection

After curing, check the final surface for depressions by applying water in the presence of the Authority. Any variation in the final surface shall be repaired as recommended by the resilient surfacing manufacturer, all at Contractor's expense.

B. Manufacturer's Field Service

Provide notice to and pay for the manufacturer's representative to be present during the entire placement of the resilient surfacing. Do not place resilient surfacing without the presence of the manufacturer's representative.

3.7 CLEANING

A. After completion of the work, remove all material scraps, debris, and rubbish from the area.

3.8 PROTECTION

A. Protect surfaces from traffic during each application and until curing in complete and the surface is ready for traffic. Protect surface at all times from mechanical injury.

END OF SECTION 32 1823

EARTH MOVING

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

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 with City of Yonkers Plumbing Inspector 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.

1.4 SEQUENCING

A. Sequence Work of this Section to obtain required permits before start of dewatering operations. Contractor to procure approval of the City of Yonkers Plumbing Inspector for pump discharge locations as part of the demolition permit.

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 City of Yonkers 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 City of Yonkers.

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, in accordance with the City of Yonkers requirements.

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.
   2. City of Yonkers to determine the acceptability of the existing building sewer connections to the combined storm sewer for dewatering discharge location.

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 City of Yonkers demolition permit.

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 designated by the City of Yonkers.

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 City of Yonkers.

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. Town of Southeast to determine ultimate discharge location of the dewatering line as part of the demolition permit.

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

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

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

B. New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-20-001.

1.2 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.

1.3 REFERENCES

A. Materials installation, maintenance, inspection and removal shall be in accordance with the *New York Standards and Specifications for Erosion and Sediment Control*.

1.4 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.

1. Samples of any kind shall be submitted upon Engineer’s request.

C. The Contractor shall submit schedules for the accomplishment of temporary sediment control work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Products shall be as specified on the contract drawings and as stated in *New York Standards and Specifications for Erosion and Sediment Control*.

PART 3 - EXECUTION

3.1 INSTALLATION

A. 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.

B. 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.

C. 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.

D. 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.

E. Maintenance shall be performed as directed by the Engineer. All sediment deposits shall be considered unsuitable material and properly disposed of.

F. The Contractor shall immediately repair or replace defective or damaged portions of the erosion and sediment control facilities.

G. 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 31 2500

EXCAVATION SUPPORT AND PROTECTION

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 temporary excavation support and protection systems.

B. Related Sections include the following:

1. Section 01 5000 - Temporary Facilities and Controls for temporary utilities and support facilities.

1.3 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.
2. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.
3. Prevent surface water from entering excavations per Division 01 General Requirements.
4. Monitor vibrations, settlements, and movements.

1.4 SUBMITTALS

A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.

1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For Installer and professional engineer.

D. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Construction Manager and then only after arranging to provide temporary utility services according to requirements indicated.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
2. The geotechnical report is included elsewhere in the Project Manual.

C. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
   1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Construction Manager if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 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. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches (75 mm).

E. Tiebacks: Steel bars, ASTM A 722/A 722M.

F. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 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.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct walks or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

D. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.3 SOLDIER BEAMS AND LAGGING

A. Install steel soldier beams before starting excavation. Space soldier beams at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier beams as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at centers indicated and secure to soldier beams.

3.4 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.5 UNDERPINNING

A. Excavate as required for placing underpinning in alternate sections not exceeding 2'-0" in width and to depths required to install the concrete Work as shown. If not otherwise shown carry the underpinning down to the level of the footings of the new construction. Alternate sections of concrete underpinning shall be in place supporting the superimposed loads properly before adjacent sections of earth are excavated.

B. Provide approved shoring as required to prevent damage to existing Work until the under pinning is complete and in condition to support the structure.

C. Install forms for exposed faces and at each end of each section of the concrete underpinning. No forms will be required for underpinning in contact with existing Work.

D. Roughen and clean existing concrete surfaces that will be in contact with concrete underpinning. Wet such surfaces and then coat with neat cement grout. Place new concrete before the grout has attained its initial set.

E. Install concrete underpinning in alternate sections not exceeding 4'-0" in width and up to approximately 3 inches below the bottom of the existing foundations to be supported. Provide a 2 x 4 inch key type

construction joint for full height of the concrete at each end of each section. After the underpinning has set for 24 hours, pack the void between the top of the underpinning and the existing Work full with stiff concrete solidly rammed in place.

F. Provide wedges, plates and beams to transfer the load of the structure to the underpinning if required to prevent settlement.

3.6 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.7 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. Fill voids immediately with approved backfill compacted to density specified in Section 31 20 00 Earth Moving-Site.
2. Repair or replace, as approved by Architect or Construction Manager, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION

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

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
a.		
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

CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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. 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

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 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.

3.5 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.

3.6 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.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.8 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.

3.9 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.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports at contractor’s expense.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 1313

SECTION 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; 2017.

D. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.

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 1810
EROSION CONTROL AND INSPECTIONS OF SEDIMENT CONTROLS

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. Coordinate with Section 01 5713.

1.2 DESCRIPTION OF WORK

A. The contractor shall provide all labor, materials, equipment and services to install all erosion control measures as specified herein or as specified on the drawings.

B. It is the intent of this specification to effectively eliminate erosion and to prevent sediment from reaching the existing storm drainage system through the use of stone sediment filters, sediment basins, silt fencing and other methods.

1.3 REFERENCES

A. All erosion control measures shall be as specified herein, or detailed on the drawings, and as described in the New York State guidelines for Urban Erosion and Sediment Control, and shall conform to the standards of Westchester County Soil and Erosion Control Commission and to the NYS Department of Environmental Conservation.

B. Refer to the Erosion and Sediment Control Plan prepared for this project which outlines the erosion and sediment controls and installations required for this work.

1.4 SUBMITTALS

A. Submit shop drawings for all erosion control devices.

PART 2 PRODUCTS

2.1 MATERIALS

A. Silt fencing, straw bale sediment barrier, sediment basin or trap, stabilized construction entrance and dust control shall be as detailed in the N.Y.S. Manual.

B. Topsoil Stockpile
   1. Stockpiles of soil shall be protected from wind and water erosion. Stockpile shall be located on level, dry ground.
   2. Cover stockpiles with tarps or temporary seeding.
   3. All stockpiles shall be surrounded by straw bale sediment barriers and/or silt fencing properly installed.
   4. Stockpile side slopes shall not exceed 2:1.

C. Erosion control blanket shall be #S150, as manufactured by North American Green, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anti Tracking Pad: Construct site access (at each entrance) as an “anti-tracking pad” a minimum of 25 feet in width by at least 50 feet in length. Construction to be of a layer of filter fabric over existing or revised grade followed by a 2 course installation of 6” - 9” sized stone. Area shall be maintained throughout the entire period; “pad” to be removed and curb/walk/green strip to be restored under ensuing contract.

B. Install silt fencing, straw bale sediment barriers, sediment basins, stabilized construction entrance, topsoil stockpile and protection, where indicated on the drawings, or as described here, all in accordance with the N.Y.S. Manual

C. Silt fence shall be installed as required. Fabric shall be embedded in a 6 inch deep trench with tamped compacted backfill. Stakes shall be spaced as shown.

D. On slopes equal to or greater than 3:1, Install erosion blanket on graded slopes immediately after seeding has occurred, or not less than 24 hours after slope has been graded. Install as per manufacturer's recommendations.

3.2 MAINTENANCE

A. All erosion control measures shall be inspected and repaired as required on a weekly basis and after each storm. Repairs shall be made promptly to prevent downstream erosion and siltation.

B. Inlet traps and inlet protection devices shall have all sediment removed when the volume of storage is half full. Gravel filter shall be replaced following significant events and when flow begins bypassing structure.

C. Contractor shall provide to the Owner's Representative, weekly copies of a report for his inspection, findings and action taken.

END OF SECTION

SYNTHETIC GRASS SURFACING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

PART 1 - The extent of artificial turf work is shown on the drawings.

PART 2 - Artificial turf work includes, but is not limited to, the following:

SCHEDULE 0 - A complete synthetic turf system, consisting of a vertical draining gravel blanket and nominal 2.25 long polyethylene parallel-ling slit and monofilament blended fibers, tufted through the same stitch into a primary backing with a secondary backing consisting of a minimum of 22 ounces of urethane per square yard.

SCHEDULE 1 - A resilient infill system, consisting of a mixture of rubber granules and sand.

SCHEDULE 2 - Tufted-in game lines and perimeter lines per drawings. Remaining required game marking shall be permanently inlaid or painted as per drawings, direction of Owner or Owner's Representative.

SCHEDULE 3 - Pre-manufactured porous ShockPad.

SCHEDULE 4 - Edge details.

SCHEDULE 5 - Maintenance manual.

SCHEDULE 6 - Written company warranty: 8-year warranty or 12-year (8-year plus 4-year supplemental warranty when installed over an approved pad), supported by a 3rd party insured 8-year warranty policy from an A-Rated domestic insurance carrier. Letters of credit are not permissible. Actual and current policy must be submitted for verification.

SCHEDULE 7 - Striping and seaming plan: Striping plan; layouts for the sports as shown on the drawings showing any field lines, logos, markings and boundaries.

SCHEDULE 8 - Train field maintenance personnel in proper care maintenance procedures.

SCHEDULE 9 - When applicable, Field Builder and Base Construction Contractor to coordinate to make sure soccer goal footings are in correct locations.

PART 3 - Provide all materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

PART 4 - The artificial turf shall be specifically designed, manufactured and installed for soccer. At the time of substantial completion, the system's shock attenuation shall have an average G-max value less than 110 based on ASTM-F355A. At no time shall the G-max value exceed 145 throughout the life of the warranty.

PART 5 - Copies of independent laboratory test reports on system or components:

SCHEDULE 0 - ASTM D 792 Specific Gravity

SCHEDULE 1 - ASTM D 1335 Tuft Bind

SCHEDULE 2 - ASTM D 5034 Grab Breaking Strength

SCHEDULE 3 - ASTM D 418 Pile Height, Tuft Spacing, Face Weight and Total Weight

SCHEDULE 4 - ASTM D 2859 Flammability (Pill test)

SCHEDULE 5 - ASTM F 1551 Water Permeability

SCHEDULE 6 - Soccer System Specific Performance Testing as Follows:

- AAA FIFA TM 04a – Shock Absorption
- AAA FIFA TM 04b – Vertical Deformation
- EN 15301-1: 2007 - Rotational Resistance Studded
- ASTM F3146 Critical Fall Height – HIC
- EN 12235: 2013 – Vertical Ball Rebound
- EN 12234 2013 – Ball Roll
- FIFA TM 14 – Heat Test
- ISO 4919: 2012 Un-aged Tuft withdrawal
- ISO 4919: 2012 & EN 13744: 2004 14 days water aged tuft withdrawal
- ISO 13934-1: 2013 Un-aged Carpet Tensile Strength Direction of manufacturer and perpendicular of manufacturer.

**All results must meet established testing criteria standards and be tested by a reputable independent laboratory specializing in artificial turf performance testing for soccer applications.*

PART 6 - Prior to Final Acceptance, the Field Builder shall submit to the owner three (3) copies of their maintenance manuals. These manuals will include all necessary instructions for the proper care and maintenance of the newly installed synthetic turf system.

PART 7 - Related Requirements:

SCHEDULE 0 - Section 033013 “Cast-In-Place Concrete for Sitework” for concrete edge restraints.

SCHEDULE 1 - Section 312013 “Earth Moving for Sitework” for preparation, compaction, and grading for granular base.

1.02 SUBMITTALS

Submit the following within 48 hours of bid opening, as requested:

A. Three (3) copies of most recent installation/reference list for all projects of similar scope to this project completed in the last three years.

B. Three (3) copies of most recent independently audited financial statements.

C. Three (3) copies of required 3rd party insurance policy, demonstrating that all of the requirements outlined in Section 1.04 F Quality Assurance are met. Actual policy must be submitted.

D. One (1) 12" x 12" sample of proposed synthetic turf carpet and one (1) 12" x 12" boxed turf sample including infill representative of finished synthetic turf system. Also submit three (3) copies of product data and testing documents demonstrating that proposed system meets or exceeds all specified requirements. One (1) 12" x 12" sample of rubber ShockPad must also be submitted, if applicable.

Note: If these submittal items are requested and deemed to be insufficient, the Field Builder will not be approved.

Submit the following prior to the ordering of materials:

A. Provide a colored striping plan detailing lines, graphics and letters. Coordinate with Owner or Owner's Representative and Architect to get final approval of all designated colors, dimensions and logo/lettering designs.

B. Material Certificates and Samples: Provide electronic copies for each material from material producer that will be used for this project. Each material certificate must be stamped and checked as approved by the Field Builder before submittal to the Architect.

C. Provide to the Architect materials samples of the following: Two (2) 12" x 12" samples of synthetic turf carpet and color yarn samples, two (2) bagged samples each of rubber and sand infill material.

D. Submit two (2) 12" x 12" samples of 10mm porous rubber ShockPad with product data sheet.

E. Submittals: Prior to order of materials, the Field Builder shall submit a sample warranty, seam layout plan, striping plan and any details of construction that deviate from the plans and specifications.

F. Submit three (3) copies of the resume of proposed installation foreman. Installation crew must meet or exceed all requirements outlined in Section 1.04.

G. Three (3) copies of Field Builder’s recommended maintenance equipment cut sheets.

H. Shop Drawings and Product Data

i. Provide shop drawing of all field layouts showing striping plan; layouts for Soccer, Lacrosse, Baseball, Little League and showing any field lines, markings and boundaries, alternating colors.

ii. Installation details including edge detail, other inserts and covers, layouts for lines and markings, etc. as required by contract.

E. Recycled rubber from old turf fields shall not be acceptable. A Bill of Lading letter supporting the above shall be submitted prior to procurement.

1.03 JOB CONDITIONS

A. All job conditions in Section 02200 apply.

1.04 QUALITY ASSURANCE

A. Provide a qualified installation foreman to coordinate and review the component parts of the artificial turf system. Submit a resume of experience for Architect's approval prior to starting work.

B. Rubber & Sand Filled Artificial Turf:

1. Factory-trained technicians skilled in the installation of athletic-caliber infilled synthetic turf systems will undertake the placement of the turf. Special brushing equipment and techniques will be used in the installation.

2. The designated installation crew shall have installed a minimum of 25 high quality, stadium grade rubber/sand filled synthetic turf systems of 45,000 square feet or greater in the past five years.

3. A notarized letter from the Field Builder that the installation crew and foreman are factory certified must be submitted prior to the start of turf installation.

C. The Field Builder shall meet the following criteria:

1. **Manufacturer/Field Builder's Experience:**

a. The Turf Manufacturer and the Field Builder must be experienced in the manufacturing and installation of this type of artificial turf system and provide project references of the synthetic grass system being installed at 25 similar exterior sites in the United States over the last 5 years, a minimum of 45,000 square feet each.

b. The Field Builder must have actively been in business – under its current name and ownership – for at least the past five years; and must have a minimum of 25 athletic fields still in use in the United States for a minimum of the past 5 years.

c. The Field Builder must provide competent workmen skilled in this type of artificial turf installation. The designated Supervisory personnel on the project must be certified, in writing, by the Field Builder as competent in the installation of this material, including gluing or sewing seams and proper installation of the infill mixture. The Field Builder shall have a qualified job foreman on site to certify the installation and warranty compliance.

D. Warranty:

1. The warranty coverage shall not be prorated nor place limits on the amount of the field's usage

2. The Field Builder shall submit its written company warranty: 8-year warranty (8-year plus 4-year supplemental warranty when installed over an approved pad), which warrants the usability and playability of the artificial turf system for its intended uses. A 3rd party insured 8-year warranty from an A-Rated domestic insurance carrier is required in addition to the Field Builder's warranty. Letters of credit in lieu of an insurance policy are no acceptable.

3. The Field Builder's warranty must have the following characteristics:

    a. Provide full coverage for a minimum of eight (8) or twelve (12) years from the date of Substantial Completion.

    b. Warrant materials and workmanship.

    c. Warrant that the materials installed meet or exceed the system specifications.

    d. Repair or replace such portions of the installed materials that are no longer serviceable to maintain a serviceable and playable surface.

    e. Be from a single source covering workmanship and all materials.

    f. Assure the availability of exact or substantially the same replacement materials for the artificial turf system installed for the full warranty period.

    g. Include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism and acts of God beyond the control of the Turf Manufacturer or Field Builder.

    h. Cover defects in the installation and workmanship. Assure the installation was done in accordance with both the Field Builder's recommendations and any written directives of the Field Builder's on-site representative.

    i. Shall be limited to repair or replacement of the affected areas at the option of the Field Builder, and shall include all necessary materials, labor, transportation costs, etc. to complete said repairs.

    j. The Field Builder may be required, upon the request of the Owner, to provide a list of ten (10) clients for which they have completed after-the-sale warranty work.

    k. All designs, game markings and layouts shall conform to all currently applicable National Federation State High School Association or NCAA rules and regulations, or league specific requirements, depending on what applies.

    l. All components and Field Builder’s installation method shall be designed and manufactured for use on outdoor athletic fields. The materials as hereinafter specified, shall withstand full climatic exposure in the location of the field, be resistant to insect infestation, rot, fungus and mildew; it shall also withstand ultra-violet rays and extreme heat, it shall allow the free flow of water horizontally to perimeter areas and vertically to the gravel blanket and into the field drainage system below the surface.

    m. The adhesive bonded or sewn seams of all system components shall provide a permanent, tight, secure and hazard-free athletic playing surface. All inlaid markings (game lines, logos, etc.) shall remain in place throughout the duration of the warranty period.

n. The installed artificial turf system's drainage capability shall allow water flow through the system (turf & infill) at a rate of not less than 10 inches +/- per hour.

PART 2 – PRODUCTS

2.01 SYNTHETIC GRASS SYSTEM

A. Synthetic Grass – Titan
Pile Weight: 50 oz/sy
Face Yarn Type: 100% polyethylene parallel-long slit fiber and monofilament blended in dual yarn types and dual yarn thicknesses
Yarn Size: Minimum 12,200 (parallel long slit film & monofilament fibers combined)
Yarn Thickness: Minimum 100 microns for parallel long slit film, 310 microns for monofilament fiber
Pile Height (Finished): 2.25”
Color: Field Green, Field Green / Lime Green (dual colors as alternating panels or blended fibers)
Construction: Broadloom tufted
Stitch Rate: 10/3"
Tufting Gauge: 1/2"
Primary Backing: ArmourLoc 3L™
Secondary Backing: 22 oz/sy urethane
Backing Weight: 7.5 oz/sq. yd minimum

Total Product Weight: 80 oz/sy (+/- 2 oz)
Finished Roll Width: 15’
Finished Roll Length: Up to 220’
Perforation (Outdoors): 3/16" holes on staggered 4" (approximate) centers
Turf Permeability: > 20" +/- per hour
Infill Composition: Ambiently ground SBR crumb rubber mixture and rounded or sub-angular, uniformly sized silica sand. Note: Other infills including EPDM rubber available.

The carpet shall be delivered in 15-foot wide rolls with the four (4") inch white soccer mid and lines tufted into roll, when applicable. The perimeter white line shall also be tufted into the individual sideline rolls, when applicable. The rolls shall be of sufficient length to go from sideline to sideline. Head seams, between the sidelines, will not be acceptable.

As applicable, provide game markings as follows: soccer, football, flag football, field hockey, boys’ lacrosse, girls’ lacrosse, logos, letters, and related markings shall be cut in and glued or painted in accordance with design drawings.

Provide a school or owner logo as follows: Brewster Bears Logo and lettering provided by school.

A. Seaming Materials:

Adhesives for bonding tufted synthetic turf shall be two-component fast-set urethane adhesive obtained from a single manufacturer and be equivalent to Ultrabond Turf PU 2K as manufactured by Mapei Corporation, Deerfield Beach, FL (800) 992-6273, or one-part moisture-cured polyurethane obtained from

a single manufacturer and be equivalent to 34-G as manufactured by Synthetic Surfaces, Inc., Scotch Plains, NJ (908) 233-6803, or approved equal as designated by the Field Builder.

1. Seaming Tape: Tape for securing seams in the tufted synthetic turf and inlaid lines shall be high quality tape made with a minimum roll width of 12 inches.

If seams are to be sewn, they must be sewn with high quality cord/thread as recommended by Field Builder.

B. Resilient Infill: A resilient infill system, consisting of a specially formulated mixture of approximately 3 lbs. per square foot of rubber and 3 lbs. per square foot of sand (a minimum of 6 lbs. per square foot) to provide the look, feel, footing and shock absorption of a natural grass field in ideal conditions.

1. Ambiently ground SBR Crumb Rubber. Granules shall contain minimal dust or contaminants and shall be derived from the ambient processing form of recycled tires. Color shall be substantially black and shall meet the 10 – 20 or 8 – 16 mesh size designation.

A. The clean, uniformly sized particles shall be consistent in shape and particle size distribution.

B. The particles shall resist abrasion in high traffic and excessive wear applications and provide stability to artificial sports turf applications.

C. The particles shall be processed and sized under rigid specifications and Manufacturers' statistical and quality control assurance program.

D. Particles shall be structurally pure and consistently uniform in size distribution for predictable performance.

2. Sand Particulate. The sand provided as a component of the infill mixture shall be rounded or sub-angular so as to minimize abrasion to the athlete and synthetic grass fibers.

D. **BASE BID:** Standard of Quality shall be A-Turf Titan S-50 synthetic turf system as built by A-Turf, Inc. or Architect approved equal. Contact A-Turf: 888-777-6910.

Manufacturers for synthetic turf alternates shall meet or exceed the requirements listed in Part 2.01. If these submittal items are requested and deemed to be insufficient, the Field Builder will not be approved.

2.02 RESILIENT UNDERLAYMENT (PRE-MANUFACTURED RESLIENT SHOCKPAD) – (Alternate Bid Item)

A. The ShockPad shall be a porous composite (100% SBR particles bound with polyurethane) rubber pad (6010SP) in typical thickness of 10mm and shall have an infiltration rate of not less than 12 inches (12”) per hour, a minimum recovery rate of 94% at 100 psi per ASTM F36 and a tensile strength of 44 psi per ASTM D412, Die C. Material shall be delivered in four foot (4’) wide rolls with protective wrapping, and be of such continuous length to cover the width of the field allowing only one head seam per roll. Standard of quality shall be 6010SP resilient ShockPad as manufactured by ECORE International or Architect approved equal. Contact ECORE: 800-322-1923.

2.03 VERTICAL DRAINAGE BASE MATERIALS

B. Excavation: Existing natural grass field shall be excavated to the depth established by the Architect and as shown on the excavation plan. The sub grade shall be shaped to achieve a .5% (one half of one percent) slope from the center of the field to each sideline in order to mirror the grade of the finished synthetic turf surface. The sub grade shall also be compacted and proof rolled to a minimum of a 95% compaction rate.

C. Geotextile Filter Fabric: Non-woven polypropylene geotextile fabric shall be chemically and biologically inert and shall be Mirafi 140N, Mirafi Inc., Pendergrass, GA (888) 795-0808, or approved equal.

D. Drainage Pipe: A network of perforated HDPE highway grade drainage pipe (1" x 12" flat panel pipe) shall be installed under a free draining base aggregate. The drainage pipe will be installed every 15 feet on center and will be connected to perimeter collector lines as shown on drawings. ADS AdvanEdge, 800-821-6710 or approved equal.

C. Stone Base Courses. See Section 312013 “Earth Moving for Sitework,” for preparation, compaction, and grading for granular base.

The following gradation of stone is a typical and recommended specification. The synthetic turf Base Contractor is required to focus on achieving the planarity, porosity and compaction requirements to provide a sound crushed stone base for synthetic turf installation.

1. The free-draining base aggregate base layer shall consist of a consistent depth of open graded material. Base drainage aggregate must be rolled and compacted to eliminate settling. Material shall conform to the AASHTO #57 limestone classification. An open graded aggregate material may be used if available. Subgrade must achieve 95% compaction level and pass a proof roll before placement of the drainage stone can commence.

¾” Gravel Base Aggregate

Sieve	Approximate Percentage Passing
1-1/2” Sieve	100%
1” Sieve	95-100%
1/2” Sieve	25-60%
#4 Sieve	0-10%
#8 Sieve	0-5%

¼” Finish Stone Layer

Sieve	Approximate Percentage Passing
1/2”	100%
3/8”	95-100%
#4	70-85%
#8	45-60%
#16	25-40%
#100	8-15%
#200	0-5%

It is critically important that the finish stone layer is not laser-graded at more than 1” depth. Layers deeper than 1” are susceptible to over-compaction and restriction of porosity, leading to drainage issues.

Subject to architectural approval, local or regional stone specifications that meet compaction and porosity requirements are permitted.

PART 3 – EXECUTION

3.01 SUBMITTALS

A. Prior to ordering materials, submit a 3rd party insured warranty policy, a sample warranty, seam layout of field, striping plan and all details of construction that deviate from the plans and specifications.

B. See Specification Section 33 40 00 for perimeter drainage system.

3.02 EXAMINATION

A. Before any synthetic turf Before any synthetic turf is installed, Contractor shall have a licensed Surveyor prepare a final to stone course survey/plan with elevations at 10' oc. The synthetic turf installer shall inspect the finished stone base and review the survey, and when satisfied with its condition, shall notify the Authority in writing of acceptance of the base. Submit a Certificate of Subbase Acceptance for the purpose of obtaining a complete manufacturer's warranty for the finished playing surface. The Turf Manufacturer shall also provide a Certificate of Subbase Acceptance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. The surface to receive the synthetic turf shall be inspected and certified by the manufacturer as ready for the installation of the synthetic turf system and must be perfectly clean as installation commences and shall be maintained in that condition throughout the process. The final stone base surface shall be surveyed by the contractor by means of a laser level at a (10-foot grid).

D. The installation shall be performed in full compliance with approved shop drawings. Only factory-trained technicians skilled in the installation of athletic caliber synthetic turf systems, working under the direct supervision of the manufacturer's supervisors, shall undertake the placement of the system. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the infill mixture. The manufacturer shall certify the installation and warranty compliance. The surface to receive the synthetic turf shall be inspected and certified by the manufacturer as ready for the installation of the synthetic turf system and must be perfectly clean as installation commences and shall be maintained in that condition throughout the process.

3.03 VERTICALLY DRAINING BASE

A. The synthetic turf Base Contractor shall strictly adhere to the installation procedures outlined under this section. Any variance from these requirements must be accepted in writing, by the Field Builder's on-site representative, and submitted to the Architect/Owner, verifying that the changes do not in any way affect the warranty.

B. Install geotextile fabric over excavated and prepared sub-grade in accordance Field Builder's recommendations. Provide a 36" minimum overlap at all seams. Fabric shall first be installed in the drainage trenches prior to installation of perimeter collector lines. After backfilling of all trenches is complete, the entire field shall be covered with fabric prior to the base aggregate application.

C. Trenching, Drainage Pipe Installation and Backfilling: All piping shall be as specified and connected by Field Builder's couplers, plugs etc.

1. The base grade shall be shaped to mirror the finished grade and approved by the Architect and/or Owner's Representative. The Base Contractor shall begin layout and trenching for the drainage network as indicated on the drainage plan and all details that apply. Collector lines shall be

installed before lateral lines and shall begin with the deepest elevations. Collector lines shall be connected to discharge outlet at the onset of operations. Trenching progress shall work upward in elevation to allow for immediate discharge of water from the entire field in the event of a rainfall.

2. No trenches, with or without pipe, shall be permitted, to remain unfilled overnight and/or while crews are not progressively working on site.

3. All perimeter trenches must be dug in accordance with the field drainage plan details.

4. After all collector and lateral lines have been installed, the Base Contractor shall repair any sub grade undulations prior to installing geotextile fabric.

D. Concrete Header Curb and Pressure Treated Wood Turf Nailer: The synthetic turf perimeter fastening structure shall be installed before the drainage aggregate.

1. The 6" x 24" concrete header curb shall be installed in accordance with the Drawings and/or Shop Drawings and these Specifications. The foundation of the concrete header curb shall be a compacted free draining aggregate. Future water entering the foundation shall have a free draining path directly to the perimeter collector pipe.

2. Recycled plastic 2" x 4" nailer. Nailer shall be set 1.5 inches below top of the curb by means of a Tapcon or ramset every 12 inches. This shall be the responsibility of the Base Contractor. See synthetic turf at Brewster High School detail.

E. Base Drainage Aggregate: The installation of the base drainage aggregate shall only begin after the drainage pipe installation has been inspected and approved by Owner's Representative. Installation of the Free Draining Base Aggregate shall follow procedures that protect the base grade soils and drainage pipe. The drainage pipe network and its existing elevations shall not be disrupted through ground pressures from trucks, dozers or by any other means.

1. The base grade subsoil shall be dry before undertaking the placement of base aggregate.

2. Delivery trucks shall enter the field only from the designated entrance point. Base course stone shall be dumped closest to the entrance first and continuously worked towards the furthest point of the field. Extreme care must be taken not to disturb sub grade or drainage network.

3. Track-type dozers shall push out the stone from behind the pile onto and toward the field center. Dozers shall only traffic the aggregate they are spreading.

4. Bulldozer blades shall be equipped with a laser-guided hydraulic system. Care shall be taken not to disturb or contact the base grade soils with the dozer blades or tracks. All equipment trafficking over the drainage aggregate shall insure there is a minimum depth of 3" of aggregate between the geotextile fabric and the dozer track ground contact position.

5. When the aggregate spreading is completed, the surface shall be further-firmed by a 5-ton roller. Static vibration shall not be part of this process.

6. The stone shall be left firm, but not over-compacted as to protect the porosity and drainage capabilities of the aggregate profile.

7. After the drainage stone has been uniformly spread throughout the surface, the surface shall receive a final laser finished grade. This process shall be accomplished using a turf-type tractor, or lightweight grader, equipped with high flotation tires and a hydraulically controlled laser blade.

8. The free-draining base course must be installed and shall be independently tested for an overall compaction rate of 95% proctor.

F. Finish Stone Levels: The base drainage stone final elevations shall mirror the proposed finish stone layer final grade material. Care shall be taken not to allow the coarser aggregate to surface into the profile or finished grade of the finish stone layer.

1. It is critically important that the finish stone layer is not laser-graded at more than 1” depth. Layers deeper than 1” are susceptible to over-compaction and restriction of porosity, leading to drainage issues.

2. The finish stone layer shall be applied using high flotation grading equipment. The finish stone material shall be evenly spread throughout the proposed field surface to the final pre-pad or pre-turf elevations.

3. After the finish stone material has been uniformly spread throughout the surface by the described method, the surface shall receive a final laser finish grade. This process shall be accomplished using a turf-type tractor, or lightweight grader, equipped with high flotation tires and a hydraulically controlled laser blade.

4. Care shall be taken throughout the installation not to force the finish stone material into the porosity of the base aggregate below.

5. Final finish stone layer must be graded by means of a laser within 0 to 1/2 inch from design grade. The finished surface tolerance must not exceed ¼ inch over 10 feet in all directions. Base Contractor must provide a topographical survey with a minimum of 200 shots demonstrating finished grade meets all written requirements.

6. Final layer of stone must be installed at a depth of 1 inch. Finished aggregate base must be proof-rolled by means of 2- to 5-ton roller. The finished aggregate base must achieve an overall compaction rate of 95% proctor in accordance with ASTM D1557. It shall also be flush with top of nailer.

7. The synthetic turf Base Contractor is required to stringline the entire field every five feet to identify high and low spots. And identified high and low spots must be eliminated prior to installation of the synthetic turf.

G. Base Acceptance: The Architect and/or Owner's Representative must jointly approve the base before ShockPad or turf installation can begin.

H. Optional Resilient ShockPad, when applicable:

1. After the finish stone layer grades have been approved and inspected, the resilient ShockPad shall be installed from sideline to sideline.

a. Equipment and personnel shall take extreme care to minimize disturbance of the stone base during ShockPad installation.

b. All operations shall work from behind the rolled out ShockPad or from adjacent, pre-installed pad surface.

c. One head seam shall be allowed per length. Head seams shall be staggered so as not to be within 10' of the previously installed roll.

d. The head seam shall overlap approximately 4 inches on original roll out. Second and subsequent rolls shall be rolled out within 1 inch, or less, of the previous roll and allowed to expand or contract before manually sliding in place.

e. After allowance for expansion or contraction, the padding shall slide into place so as to touch the edge or seam of the previous. Care shall be taken so as not to disturb the choker layer material when butting the seams together.

2. The Resilient ShockPad shall not receive a final cut or edging detail until the material has relaxed/expanded in direct sunlight for a minimum of six hours.

a. No open seams shall exceed 1/4" (in expanded state) after final seam or end cutting is complete.

b. Padding material shall stop just short of the exposed nailer board.

3. The Resilient ShockPad shall be inspected by the Field Builder after completion to insure the surface is smooth with only minor bumps from stone particles or other material protruding from underneath that will not show up once the turf is laid over top.

a. Expansion bubbles and open seams shall be repaired prior to final inspection.

b. Repeat inspections shall be carried out prior to each roll of synthetic turf being installed.

I. Synthetic Turf and Infill Materials

1. After a final inspection of the Resilient ShockPad by the Field Builder and the Owner's Representative, the synthetic turf installation shall begin. The first roll shall begin with the longest perpendicular cross-field distance. No head seams shall be permitted in the inbound playing surface.

2. The rolls of turf shall be rolled out a minimum of four hours prior to starting seaming procedures and allowed to relax/expand.

a. All visible wrinkles shall be stretched out before seaming.

b. Seams shall be flat, tight and permanent with no separation or fraying.

c. Synthetic turf yarn fabric that is trapped or glued between seams shall be freed from the seams by hand or other approved method to an upright position prior to the commencement of brushing and top dressing procedures.

d. All synthetic turf seams shall be assembled as follows: The full width rolls shall be laid out across the field. Utilizing standard state of the art adhering or sewing procedures, each roll shall be attached to the next.

e. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed perpendicular to the playing field. The yard lines, game markings, sidelines, etc. of all applicable sports shall be tufted into carpet by the manufacturer wherever possible.

3. After all seaming is completed and inlaid lines, logos and lettering have been installed; the infill materials shall be spread evenly, using a drop spreader or top dresser.

a. Crumb rubber and sand shall be applied in a uniform rate of multiple applications until the specified infill depth is achieved.

b. Infill material shall be brushed between infill applications with a motorized rotary broom and pull-type groomer brush simultaneously.

c. A minimum infill rate of 3 lbs. of rubber and 3 lbs. of sand per square foot is required.

J. Tufted and Inlaid Lines

1. Layout and descriptions of tufted, inlaid and/or painted lines shall be as indicated on final shop drawings.

2. Inlaid lines and field markings shall be cut in using seaming methods recommended by the Field Builder.

K. Synthetic Turf Perimeter Attachment:

1. After final trimming of the turf, the turf shall be screwed, nailed or stapled to the pressure treated wood nailer system as per the Field Builder's recommendations.

3.04 FIELD LAYOUT

A. Game Line Layout: Designs, markings, layouts, and materials shall conform to all currently applicable National Collegiate Athletic Association rules, NFHS rules, and/or other rules or standards that may apply to this type of synthetic grass installation. Designs, markings and layouts shall first be approved by the Architect in the form of final shop drawings.

B. Game Line Installation: Dimensions of the field and locations for markings shall be measured by a registered surveyor to verify conformity to the specifications and applicable standards. A record of the finished field as-built measurements shall be made.

3.05 LINE MARKINGS

A. Line markings for game fields shall be installed as specified herein and in accordance with the Drawings and approved Shop Drawings.

B. Templates for numerals, arrows, and other markings shall be given to the Owner for future use.

3.06 CLOSEOUT

A. The Field Builder must verify that a qualified representative has inspected the installation and that the finished field surface conforms to the Field Builder's requirements.

B. The Field Builder shall provide a warranty to the Owner that covers defects in materials and workmanship of the turf for a period of 8 years from the date of Substantial Completion as described in 1.04 F. Submit three (3) copies of the warranty.

C. The company's 8-year (8-year plus 4-year supplemental warranty when installed over an approved pad) warranty must also be supported by a 3rd party insured 8-year warranty from an A-rated domestic insurance carrier. Only true 3rd party policies will be accepted. Companies submitting policies that are actually letters of credit or not truly a 3rd party insurance policy will not be accepted. Submit three (3) copies of the actual insurance policy.

D. The Field Builder must submit three (3) copies of its standard maintenance manual to the owner.

E. Field Builder must train Owner's designated field personnel in proper grooming and care procedures. This includes training field personnel how to properly use grooming equipment as well as make minor repairs.

F. Extra materials: Field Builder must leave 500 lbs. of rubber granules and the equivalent of 15' x 10' (all pieces combined) of turf with Owner before leaving job site. All salvageable pieces of colored turf used during the installation should be left with the Owner as well.

3.07 CLEAN UP

A. Field Builder shall provide the labor, supplies and equipment as necessary for final cleaning of surface and installed items.

B. All usable remnants of new material shall be neatly rolled up and turned over to the Owner at a place and area designated by the Owner.

C. During the contract and at intervals as directed by the Architect and as synthetic turf installation is completed, clear the site of all extraneous materials, rubbish, or debris and leave the site in a clean, safe, well draining, neat condition.

D. Surface, recesses, enclosures, etc. shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

3.08 G-MAX TESTING

A. The Field Builder shall hire an independent testing laboratory to perform a G-max test (ASTM 355, 1936 method) to verify that the shock attenuation properties of the field meet the requirements set forth in this specification. Submit three (3) copies of the G-max test to the Owner.

B. At the time of substantial completion, the average G-max rating must not exceed 110 for a padded system and 135 for a non-padded system. The average G-max of a padded system must not exceed 145 and for a non-padded system 165 at any time during the life of the warranty. The Owner reserves the right to have the field tested for shock attenuation at its own cost at anytime it deems necessary. If at anytime the G-max ranges reach unacceptable levels, it is the responsibility of the Field Builder to bring the field back into the required ranges at no cost to the Owner.

END OF SECTION 32 1822

TRACK MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide labor, materials, equipment, services required to provide markings and lines for tracks and courts on resilient surfacing, asphaltic concrete paving, and colored athletic wearing surface.

1.2 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. NYS Department of Environmental Conservation (DEC) - Part 205 on "Architectural Surface Coatings"

1.3 SUBMITTALS

A. Product Data

Submit product data and manufacturers' application instructions for the material for each type of surface.

B. Samples

Submit color samples of each type and color of line marking.

C. Shop Drawings

1. Submit "Line Layout Drawing" prior to applying line markings.

2. Upon completion of line marking work, submit three (3) certified line layout drawings indicating all lines and colors.

1.4 QUALITY ASSURANCE

A. Qualifications

Line Markers: Personnel with a minimum of three years experience.

B. Regulatory Requirements

1. NYS Department of Environmental Conservation - Part 205 on "Architectural Surface Coatings" - for Volatile Organic Compounds (VOC).

2. Line marking shall conform to the requirements of the following agencies.

a. National Federation of State High School Athletic Association.

b. Public School Athletic League of New York City.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in original, sealed containers or drums, with labels legible, intact, and unbroken.

B. Comply with Health and Fire Regulations.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface is wet or contains frost.

B. Comply with manufacturer's instructions for temperature and other requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS OF PAINT AND COATINGS

A. Sherwin Williams (800 524-5979) for markings on resilient surfacing and asphaltic concrete pavement.

B. California Products Corp. (800 225-1141) for markings on athletic wearing surface.

C. Surface Signs (718 507-5437) for markings on asphaltic concrete pavement.

2.2 MATERIAL

A. Line Paint for Resilient Surfacing

Latex traffic marking paint such as Setfast Latex Traffic Marking paint by Sherwin Williams.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection

Protect surfaces not to be painted. Avoid spray of any kind.

B. Surface Preparation

1. Prepare surface to satisfaction of the Authority prior to line painting.

2. Remove by broom, vacuum, or blower all dust, dirt, and other loose materials on surface to be painted.

3. Comply with manufacturer's latest requirements and recommendations.

3.2 APPLICATION

A. Line Painting

1. Accurately measure and layout line markings.

2. Apply paint with mechanical equipment.

3. Paint lines as shown on the Drawings and as specified below under "Track Marking".

4. Provide uniform straight edges.

5. Apply not less than two coats of paint in accordance with manufacturer's recommended rates. Thermoplastic coating thickness shall be 1.7mm to 2.5mm.

6. Lines shall be 2" wide unless otherwise indicated.

B. Track Marking

1. Employ a Licensed Land Surveyor to accurately measure and lay out line markings in accordance with National Federation of State High School Athletic Assoc. Regulations.

2. Events

a.	100 meter dash	h.	4 x 100 meter relay
b.	200 meter dash	i.	4 x 200 meter relay
c.	400 meter dash	j.	4 x 400 meter relay
d.	800 meter run	k.	110 meter high hurdles
e.	1500 meter run	l.	400 meter intermediate hurdles
f.	3000 meter run	m.	Girls 100 meter hurdle
g.	One mile run		

3. Hurdle location markers..yellow hash marks.

4. Lane lines.....white (min. 42" apart).

5. Exchange zones.....4 x 100 - green, 4 x 200-blue, 4 x 400 - yellow, 12" across entire lane width.

6. Lane numbers.....Stenciled in three locations from inside-out.
Numbers shall be 24" high and white in color.

7. Finish line to be located near bleachers.

8. All starts and finishes to be white.

3.3 CLEANING

A. Upon completion of work, remove containers and debris and leave site in clean orderly condition acceptable to the Authority.

3.4 PROTECTION

A. Erect temporary barriers to protect paint during drying period.

B. Protect markings from damage till completion of project.

END OF SECTION 32 1824

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.

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

EXTERIOR PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Trees.
2. Shrubs.
3. Ground cover.

B. Related Sections include other Division 2 Sections.

1.3 DEFINITIONS

A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than sizes indicated; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1, “American Standard for Nursery Stock”.

B. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1, “American Standard for Nursery Stock”, for kind, type, and size of exterior plant required.

C. Finish Grade: Elevation of finished surface of planting soil.

D. Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

1.4 SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Planting Schedule: Indicating anticipated planting dates for exterior plants.

C. Weed Barrier: Product cut sheet and sample.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

D. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock".

E. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

F. Observation: Engineer/Landscape Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Engineer/Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Engineer/Landscape Architect of sources of planting materials seven days in advance of delivery to site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees and shrubs before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

B. Handle planting stock by root ball.

C. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 COORDINATION

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: April 1 to June 1.
2. Fall Planting: September 1 to October 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

C. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Engineer/Landscape Architect.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.8 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.

1. Warranty Period for Trees and Shrubs: One year from date of substantial completion.
2. Warranty Period for Ground Cover and Plants: One year from date of substantial completion.
3. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
4. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

1.9 MAINTENANCE

A. Trees and Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.

1. Maintenance Period: Twelve months from date of substantial completion.

B. Ground Cover and Plants: Maintain for the following maintenance period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings:

1. Maintenance Period: Twelve months from date of substantial completion.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement. All plant materials shall be non-invasive.

B. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Engineer/Landscape Architect, with a proportionate increase in size of roots or balls.

C. Label each tree with securely attached, waterproof tag bearing legible designation of botanical and common name.

D. Label at least one shrub of each variety in a group with a securely attached, waterproof tag bearing legible designation of botanical and common name.

E. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

2.2 SHADE AND FLOWERING TREES

A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Provide balled and burlapped trees.
2. Branching Height: One-third to one-half of tree height.

B. Small Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Single stem.
2. Provide balled and burlapped specimens.

C. Multistem Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Clump.
2. Provide balled and burlapped specimens.

2.3 DECIDUOUS SHRUBS

A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.

1. Provide balled and burlapped and/or container-grown specimens as designated in the plant list.

2.4 CONIFEROUS EVERGREENS

A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

B. Form and Size: Specimen-quality, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens and the following grade:
1. Provide balled and burlapped specimens as designated in the plant list.

2.5 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

1. Provide balled and burlapped and/or container-grown specimens as designated in the plant list.

2.6 GROUND COVER PLANTS

A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

2.7 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.

2.8 INORGANIC SOIL AMENDMENTS

B. 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.

C. 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.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.8 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.

2.9 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

2.10 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Ground or shredded bark or bark chips.

2.11 STAKES AND GUYS

A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches (50 by 50 mm) by length indicated, pointed at one end.

B. Guy and Tie Wire: ASTM A 641/A 641M, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.

C. Guy Cable: 5-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.

D. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.

E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.12 MISCELLANEOUS PRODUCTS

A. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch- (100-mm-) wide minimum, with stretch factor of 33 percent.

B. Landscape Weed Control Fabric: Non-woven polypropylene, brown, 3.5 oz, 20 year.

C. Anchoring pins: 8” x 2” x 8” galvanized steel.

2.13 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with the soil amendments and fertilizer as recommended by the qualified soil testing laboratory.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain owners acceptance of layout before planting. Make minor adjustments as required.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.3 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

      a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

3.4 TREE AND SHRUB EXCAVATION

A. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.

   1. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.

B. Subsoil removed from excavations may not be used as backfill.

C. Obstructions: Notify Engineer/Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Engineer/Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE AND SHRUB PLANTING

A. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball 1 inch (25 mm) above adjacent finish grades.

   1. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
   2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

B. Set container-grown stock plumb and in center of pit or trench with top of root ball [flush with] adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

C. Organic Mulching: Apply 3-inch (75-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems.

D. Wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping.

3.6 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs as directed by Engineer/Landscape Architect.

B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Engineer/Landscape Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

3.7 GUYING AND STAKING

A. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1830 mm) above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Support trees with two strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Use the number of stakes as follows:

1. Use 2 stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; 3 stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.

3.8 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants as indicated.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil.

C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING BED MULCHING

A. Mulch backfilled surfaces of planting beds and other areas indicated.

1. Organic Mulch: Apply 3-inch (75-mm) average thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

3.10 CLEANUP AND PROTECTION

A. During exterior planting, keep adjacent pavings and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

3.11 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 32 9000

TURFS AND GRASSES

PART 1 - GENERAL

1.1 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 (Meadow Areas)
   a. Provide Showy Northeast Native Wildflower & Grass Mix (ERNMX-153) at a rate of 20 pounds per acre as provided by Ernst Conservation Sees, Inc. or approved equal.

2.2 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

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.

G. 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.

H. 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., 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 and disinfect water distribution piping as follows:

1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and 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

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 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.

2.4 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 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.

2.5 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 required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or re- paired, for leaks and defects.

1. Do not put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.
5. Manholes and Sanitary Sewerage: Perform manhole vacuum testing in accordance with the latest revision of ASTM C1244-02. Perform low-pressure air testing of piping in accordance with the latest revision of ASTM F1417-92, Section 8.2.2, Time-Pressure Drop Method for a 0.5 psi drop.
6. Sewer Forcemain: Perform pressure and leakage test hydrostatically. Each forcemain test shall be for a minimum of 2 hours and at a minimum test pressure of 1.5 times operation pressure or 50 psi, whichever is greater. Allowable leakage for each forcemain is 0.5 gallons per 1,000 feet for 30 minutes.

END OF SECTION 33 3000

STORM UTILITY DRAIN PIPING

PART 1 - GENERAL

1.1 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

- ASBESTOS REPORT

Limited Environmental Survey

Brewster Central School District
30 Farm to Market Road
Brewster, NY 10509

Package 1 Survey

Brewster High School
50 Foggintown Road
Brewster, NY 10509

SEPTEMBER 2023

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ASBESTOS, LEAD & PCB SURVEY REPORT

Package 1 Survey

Brewster High School

50 Foggintown Road

Brewster, NY 10509

September 2023

Enviroscience Project No. 24040

Prepared for: Brewster Central School District
30 Farm to Market Road
Brewster, NY 10509

Prepared by: ENVIROSCIENCE CONSULTANTS, LLC
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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 1 survey (Brewster High School) was performed on September 15th, 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 1 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 1 (Brewster High School).

Asbestos

Analytical results of the bulk samples collected by Enviroscience Consultants, LLC indicate that the following materials **contain asbestos** (greater than 1-percent);

- **Through Wall/Eave Flashing Tar, Black (PAC/Main Entrance Overhang Roof)**
- **Expansion Joint Tar, Black (Structural Bridges)**

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
PAC/Main Entrance Overhang Roof	Through Wall/Eave Flashing Tar, Black	300 LF	No	Good
Structural Bridges	Expansion Joint Tar, Black	200 SF	No	Good

*** All quantities in this assessment are estimations. An abatement contractor should perform a site walk through and calculate quantities prior to submitting a proposal.**

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. #05-04280) and Wade Coble (cert. #23-07005) conducted the survey on September 15th, 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.

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:

- Roll on Roofing – Top Layer, Green (PAC/Main Entrance Overhang Roof)
- Gypsum – Second Layer, Cream (PAC/Main Entrance Overhang Roof)
- Canvas/Vapor Barrier – Third Layer, Cream (PAC/Main Entrance Overhang Roof)
- Perlite – Fifth Layer (under foam), Brown (PAC/Main Entrance Overhang Roof)
- Tar Paper – Bottom Layer (on metal deck), Black (PAC/Main Entrance Overhang Roof)
- Eave Flashing Caulk, Gray (PAC/Main Entrance Overhang Roof)
- 2'x2' Ceiling Tile, White (Main Entrance)
- 12"x12" Floor Tile, White w/Green Brown Specs (Main Entrance)
- Mastic to 12"x12" White w/Green Brown Specs Floor Tile, Black/Brown (Main Entrance)
- Textured Coating, Light & Dark Brown (Main Entrance Exterior Overhang)
- Brick/Sill Mortar, Brown (Main Entrance Facades)
- Expansion Joint Caulk, Light Brown (Main Entrance Facades)

- Exterior Door/Window Frame Caulk, Dark Brown (Main Entrance Storefront/Windows)
- Walkway Asphalt, Black (Structural Bridges)
- Mastic to EPDM, Brown/Yellow (Girl's & Boy's Locker Room RTU Platforms)
- Gypsum Board (under EPDM), Cream (Boy's Locker Room RTU Platform)
- Gypsum Board, White (Boy's & Girl's Locker Room Showers, below RTUs)
- Joint Compound, White (Boy's & Girl's Locker Room Showers, below RTUs)

Refer to the Bulk Sample Results #36427 for detailed sample information.

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:

- None

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:

- Metal, Hand Railing, Grey, Structural Bridge A
- Concrete, Wall, Tan, Structural Bridge A
- Concrete, Ceiling, White, Structural Bridge A
- Concrete, Wall, White, Structural Bridge A
- Metal, Hand Railing, Grey, Structural Bridge B
- Concrete, Wall, Pink, Structural Bridge B
- Concrete, Ceiling, White, Structural Bridge B
- Concrete, Wall, White, Structural Bridge B
- Metal, Access Panel Door, White, Boy's Locker Room Shower
- Metal, Access Panel Door, White, Girl's Locker Room Shower
- Gypsum, Ceiling, White, Girl's Locker Room Shower
- Metal, Entry Door Buck, Brown, Main Entrance Foyer
- Metal, Entry Door, Brown, Main Entrance Foyer
- Metal, Window Jamb, Brown, Main Entrance Foyer
- Metal, Window Casing, Brown, Main Entrance Foyer
- Metal, Ceiling, Brown, Main Entrance Foyer
- Gypsum, Ceiling, Cream, Main Entrance Foyer
- Metal, Inside Door Buck, Brown, Main Entrance Foyer
- Metal, Inside Door, Brown, Main Entrance Foyer
- Metal, Window Jamb, Brown, Main Entrance Security Hallway
- Metal, Window Casing, Brown, Main Entrance Security Hallway

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

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ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	9/15/2023
		DATE RECEIVED:	9/19/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 1 - Brewster High School
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	1 of 7	CUSTODY #:	36427

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
101606	01-01	Roll on Roofing - Top Layer	Green	PAC Roof	None Detected by TEM		4.0% fiberglass	89.9% organics and carbonates 6.1% silicates and opaques
101607	01-02	Roll on Roofing - Top Layer	Green	PAC Roof	None Detected by TEM		5.7% fiberglass	85.8% organics and carbonates 8.5% silicates and opaques
101608	02-03	Gypsum - Second Layer	Cream	PAC Roof	None Detected		15.0% cellulose 5.0% fiberglass	80.0% plaster
101609	02-04	Gypsum - Second Layer	Cream	PAC Roof	None Detected		15.0% cellulose 5.0% fiberglass	80.0% plaster
101610	03-05	Canvas/Vapor Barrier - Third Layer	Cream	PAC Roof	None Detected		60.0% fiberglass 15.0% cellulose	25.0% binders
101611	03-06	Canvas/Vapor Barrier - Third Layer	Cream	PAC Roof	None Detected		65.0% fiberglass 15.0% cellulose	20.0% 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: _____ PLM DATE: 9/21/2023

ANALYZED BY: _____ TEM DATE: 9/22/2023

DIRECTOR: _____ DATE: 9/22/2023

REVISION #: 0 REVISION DATE: 9/22/2023

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ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	9/15/2023
		DATE RECEIVED:	9/19/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 1 - Brewster High School
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	2 of 7	CUSTODY #:	36427

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
101612	04-07	Perlite - Fifth Layer (under foam)	Brown	PAC Roof	None Detected		65.0% cellulose	25.0% perlite 10.0% binders
101613	04-08	Perlite - Fifth Layer (under foam)	Brown	PAC Roof	None Detected		65.0% cellulose	25.0% perlite 10.0% binders
101614	05-09	Tar Paper - Bottom Layer (on metal deck)	Black	PAC Roof	None Detected by TEM		None Detected	45.2% organics and carbonates 54.8% silicates and opaques
101615	05-10	Tar Paper - Bottom Layer (on metal deck)	Black	PAC Roof	None Detected by TEM		None Detected	40.9% organics and carbonates 59.1% silicates and opaques
101616	**06-11**	**Through Wall/Eave Flashing Tar**	**Black**	**PAC Roof**	**2.5% Asbestos**	**2.5% Chrysotile**	**11.7% fiberglass**	**79.1% organics and carbonates 6.7% silicates and opaques**
101617	**06-12**	**Through Wall/Eave Flashing Tar**	**Black**	**PAC Roof**	**3.1% Asbestos**	**3.1% Chrysotile**	**11.0% fiberglass**	**76.4% organics and carbonates 9.5% 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: 9/21/2023

ANALYZED BY: _____ TEM DATE: 9/22/2023

DIRECTOR: _____ DATE: 9/22/2023

REVISION #: 0 REVISION DATE: 9/22/2023

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ELAP # 11681; NVLAP Lab Code 200531-0

ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	9/15/2023
		DATE RECEIVED:	9/19/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 1 - Brewster High School
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	3 of 7	CUSTODY #:	36427

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
101618	07-13	Eave Flashing Caulk	Gray	PAC Roof	None Detected by TEM		None Detected	81.0% organics and carbonates 19.0% silicates and opaques
101619	07-14	Eave Flashing Caulk	Gray	PAC Roof	None Detected by TEM		None Detected	82.0% organics and carbonates 18.0% silicates and opaques
101620	08-15	2'x2' Ceiling Tile	White	Main Entrace	None Detected by TEM		33.0% mineral wool	34.0% organics and carbonates 33.0% silicates and opaques
101621	08-16	2'x2' Ceiling Tile	White	Main Entrace	None Detected by TEM		30.1% mineral wool	39.7% organics and carbonates 30.2% silicates and opaques
101622	09-17	12"x12" Floor Tile	White w/Green Brown Specs	Room 119 (HM to Main Entrance)	None Detected by TEM		None Detected	97.1% organics and carbonates 2.9% silicates and opaques
101623	09-18	12"x12" Floor Tile	White w/Green Brown Specs	Cafeteria to Weight Room Hallway (HM to Main Entrance)	None Detected by TEM		None Detected	88.1% organics and carbonates 11.9% 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: 9/21/2023

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ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	9/15/2023
		DATE RECEIVED:	9/19/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 1 - Brewster High School
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	4 of 7	CUSTODY #:	36427

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
101624	10-19	Mastic to 12"x12" White w/Green Brown Specs Floor Tile	Black/Brown	Room 119 (HM to Main Entrance)	None Detected by TEM		None Detected	77.7% organics and carbonates 22.3% silicates and opaques
101625	10-20	Mastic to 12"x12" White w/Green Brown Specs Floor Tile	Black/Brown	Cafeteria to Weight Room Hallway (HM to Main Entrance)	None Detected by TEM		None Detected	74.1% organics and carbonates 25.9% silicates and opaques
101626	11-21	Textured Coating	Light & Dark Brown	Main Entrance Exterior Overhang	None Detected by TEM		None Detected	80.5% organics and carbonates 19.5% silicates and opaques
101627	11-22	Textured Coating	Light & Dark Brown	Main Entrance Exterior Overhang	None Detected by TEM		None Detected	65.5% organics and carbonates 34.5% silicates and opaques
101628	11-23	Textured Coating	Light & Dark Brown	Main Entrance Exterior Overhang	None Detected by TEM		None Detected	57.1% organics and carbonates 42.9% silicates and opaques
101629	12-24	Brick/Sill Mortar	Brown	Main Entrance Facades	None Detected		3.0% cellulose	97.0% cement
101630	12-25	Brick/Sill Mortar	Brown	Main Entrance Facades	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: _____ PLM DATE: 9/21/2023

ANALYZED BY: _____ TEM DATE: 9/22/2023

DIRECTOR: _____ DATE: 9/22/2023

REVISION #: 0 REVISION DATE: 9/22/2023

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ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	9/15/2023
		DATE RECEIVED:	9/19/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 1 - Brewster High School
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	5 of 7	CUSTODY #:	36427

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
101631	13-26	Expansion Joint Caulk	Light Brown	Main Entrance Facades	None Detected by TEM		None Detected	79.6% organics and carbonates 20.4% silicates and opaques
101632	13-27	Expansion Joint Caulk	Light Brown	Main Entrance Facades	None Detected by TEM		None Detected	76.9% organics and carbonates 23.1% silicates and opaques
101633	14-28	Exterior Door/Window Frame Caulk	Dark Brown	Main Entrance Storefront/Windows	None Detected by TEM		None Detected	78.3% organics and carbonates 21.7% silicates and opaques
101634	14-29	Exterior Door/Window Frame Caulk	Dark Brown	Main Entrance Storefront/Windows	None Detected by TEM		None Detected	79.1% organics and carbonates 20.9% silicates and opaques
101635	**15-30**	**Expansion Joint Tar**	**Black**	**Structural Bridges**	**3.5% Asbestos**	**3.5% Chrysotile**	**None Detected**	**89.5% organics and carbonates 7.0% silicates and opaques**
101636	**15-31**	**Expansion Joint Tar**	**Black**	**Structural Bridges**	**3.0% Asbestos**	**3.0% Chrysotile**	**None Detected**	**91.8% organics and carbonates 5.2% 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.

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ASBESTOS BULK SAMPLE RESULTS

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		DATE RECEIVED:	9/19/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 1 - Brewster High School
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	6 of 7	CUSTODY #:	36427

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
101637	16-32	Walkway Asphalt	Black	Structural Bridges	None Detected by TEM		None Detected	67.1% organics and carbonates 32.9% silicates and opaques
101638	16-33	Walkway Asphalt	Black	Structural Bridges	None Detected by TEM		None Detected	23.5% organics and carbonates 76.5% silicates and opaques
101639	17-34	Mastic to EPDM	Brown/Yellow	Girl's Locker Room RTU Platform	None Detected by TEM		None Detected	97.9% organics and carbonates 2.1% silicates and opaques
101640	17-35	Mastic to EPDM	Brown/Yellow	Boy's Locker Room RTU Platform	None Detected by TEM		None Detected	84.8% organics and carbonates 15.2% silicates and opaques
101641	18-36	Gypsum Board (under EPDM)	Cream	Boy's Locker Room RTU Platform	None Detected		80.0% cellulose	20.0% binders
101642	18-37	Gypsum Board (under EPDM)	Cream	Boy's Locker Room RTU Platform	None Detected		80.0% cellulose	20.0% binders
101643	19-38	Gypsum Board	White	Boy's Locker Room Showers (below RTU)	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.
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Negative by Weight – After matrix reduction, the remainder is less than 1% and, therefore, cannot fulfill the definition of asbestos containing material.
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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: 9/21/2023

ANALYZED BY: _____ TEM DATE: 9/22/2023

DIRECTOR: _____ DATE: 9/22/2023

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ASBESTOS BULK SAMPLE RESULTS

CLIENT:	Brewster CSD 30 Farm to Market Road, Brewster, NY 10509	SAMPLE DATE:	9/15/2023
		DATE RECEIVED:	9/19/2023
PROJECT NAME:	District Wide Hazardous Material Inspections for Fuller D'Angelo Projects	AREA:	Package 1 - Brewster High School
JOB #:	24040	SAMPLER:	Drew Cheskin
PAGE #:	7 of 7	CUSTODY #:	36427

Lab ID	Sample #	Description	Color	Location	Total Asbestos Result	% Asbestos-type	% Non-asbestos Fibers-type	% Matrix-type
101644	19-39	Gypsum Board	White	Boy's Locker Room Showers (below RTU)	None Detected		15.0% cellulose 5.0% fiberglass	80.0% plaster
101645	20-40	Joint Compound	White	Boy's Locker Room Showers (below RTU)	None Detected		None Detected	83.9% organics and carbonates 16.1% silicates and opaques
101646	20-41	Joint Compound	White	Boy's Locker Room Showers (below RTU)	None Detected		None Detected	81.7% organics and carbonates 18.3% 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%.
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ANALYZED BY: John A Spillane PLM DATE: 9/21/2023

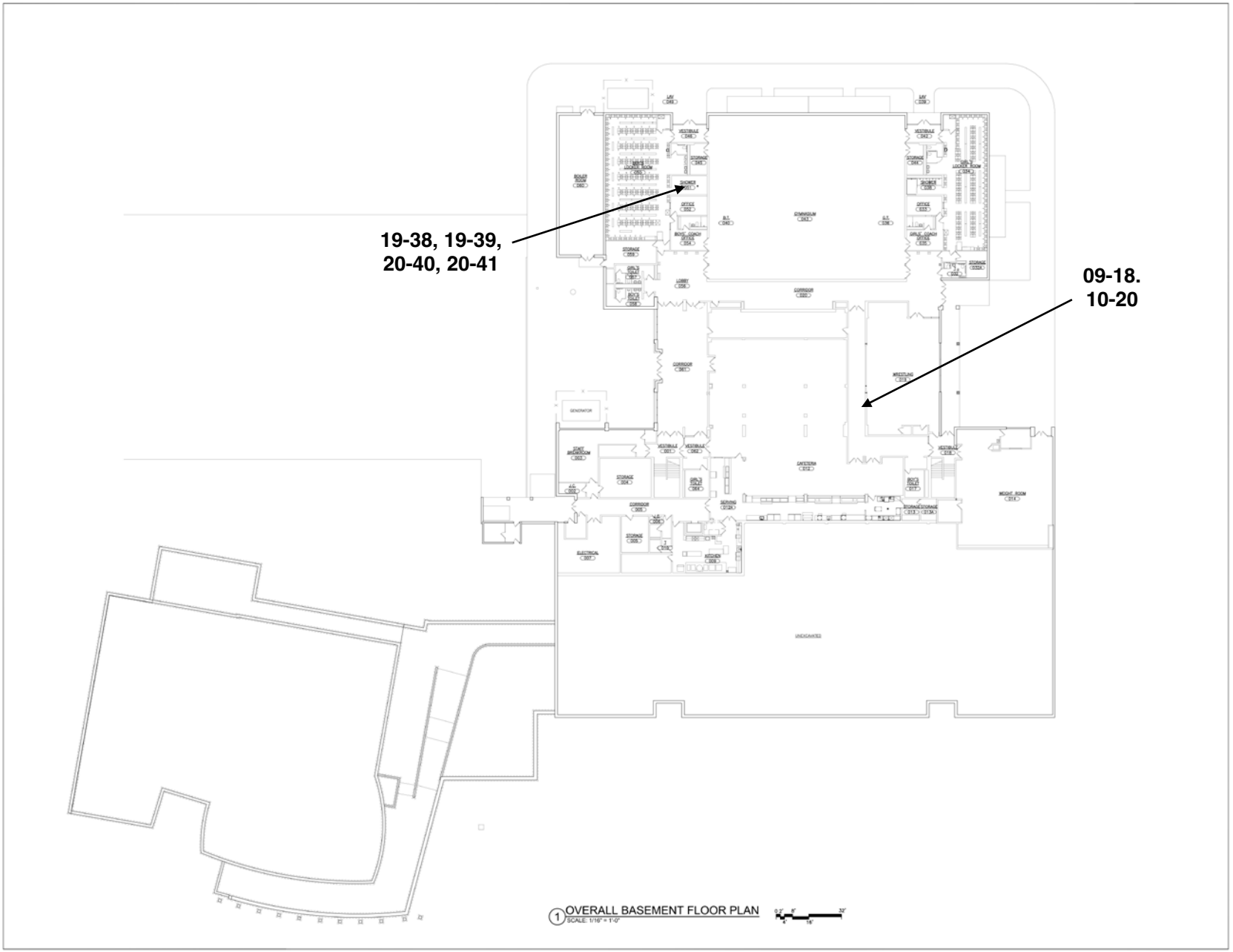
ANALYZED BY: Edward A Schuster TEM DATE: 9/22/2023

DIRECTOR: Edward A Schuster DATE: 9/22/2023

REVISION #: 0 REVISION DATE: 9/22/2023

Appendix B

Asbestos Bulk Sample Location Drawings



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KEY PLAN

NO SCALE

PROJECT
District Wide Hazardous Materials Inspections
Fuller & D'Angelo P.C. Designs
Package I

CLIENT
BREWSTER CENTRAL SCHOOL DISTRICT
30 FARM TO MARKET ROAD
BREWSTER, NY 10509

PROJECT #: 24040

COMMENTS:

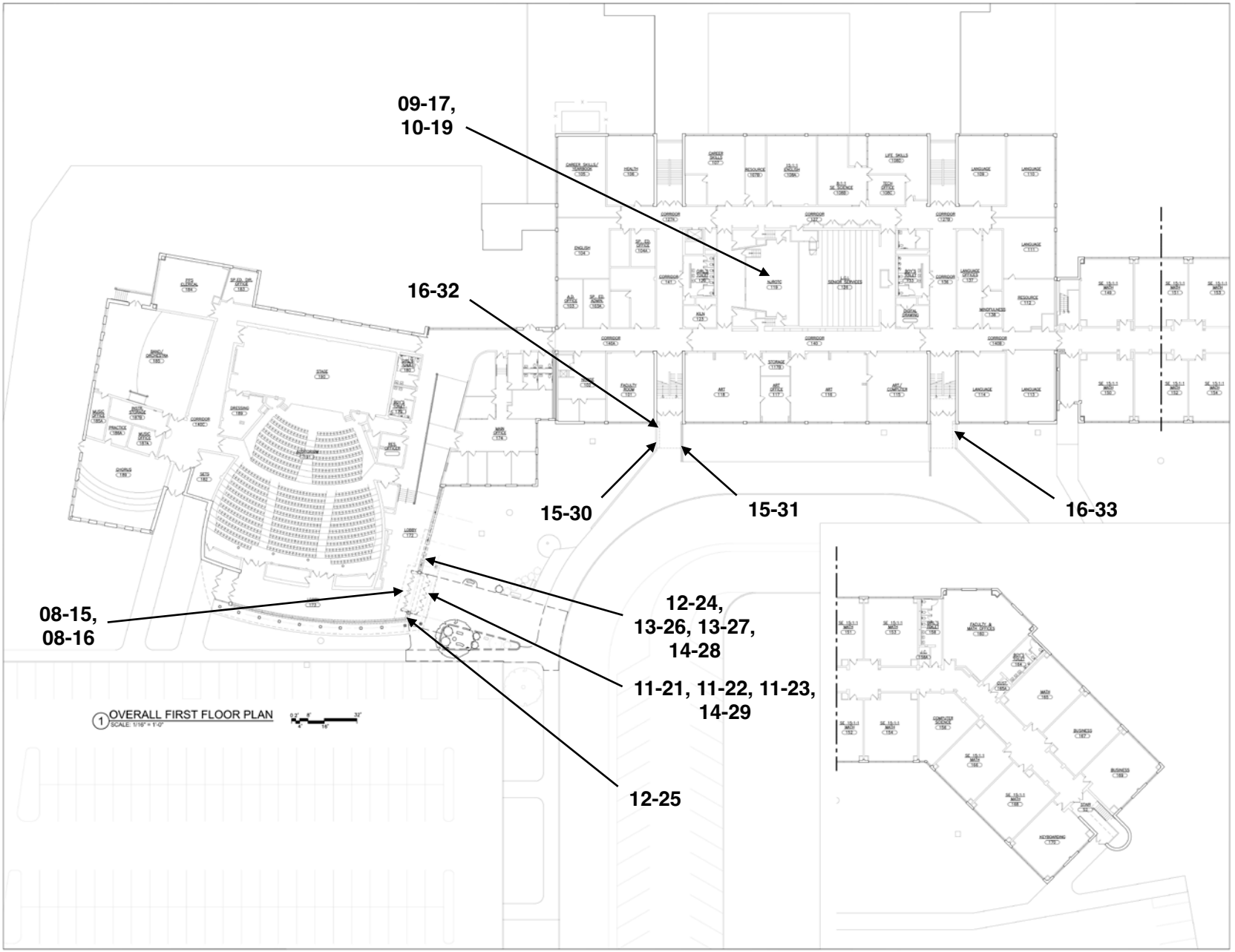
BULK SAMPLE LOCATION PLAN

NOT TO SCALE

Date: 09/2023

By: Drew Cheskin

DRAWING 1 of 3



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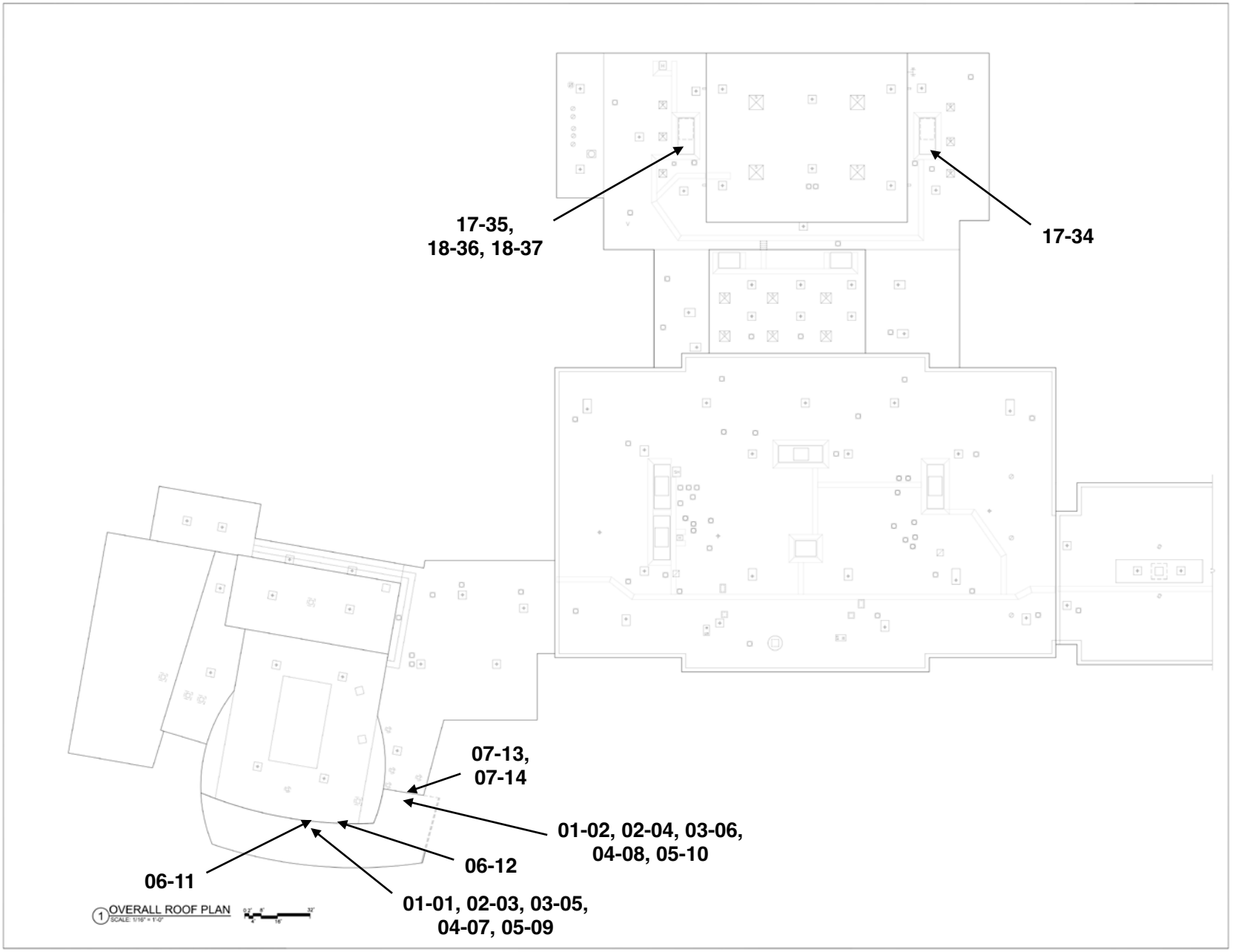

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PROJECT #: 24040

COMMENTS:

BULK SAMPLE LOCATION PLAN

NOT TO SCALE

Date: 09/2023

By: Drew Cheskin

DRAWING 3 of 3

Appendix C

Asbestos Containing Materials Location Drawings

LEGEND

Location of asbestos containing Expansion Joint Tar, Black

1 OVERALL FIRST FLOOR PLAN
SCALE: 1/16" = 1'-0"

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ASBESTOS CONTAINING MATERIALS
LOCATION PLAN

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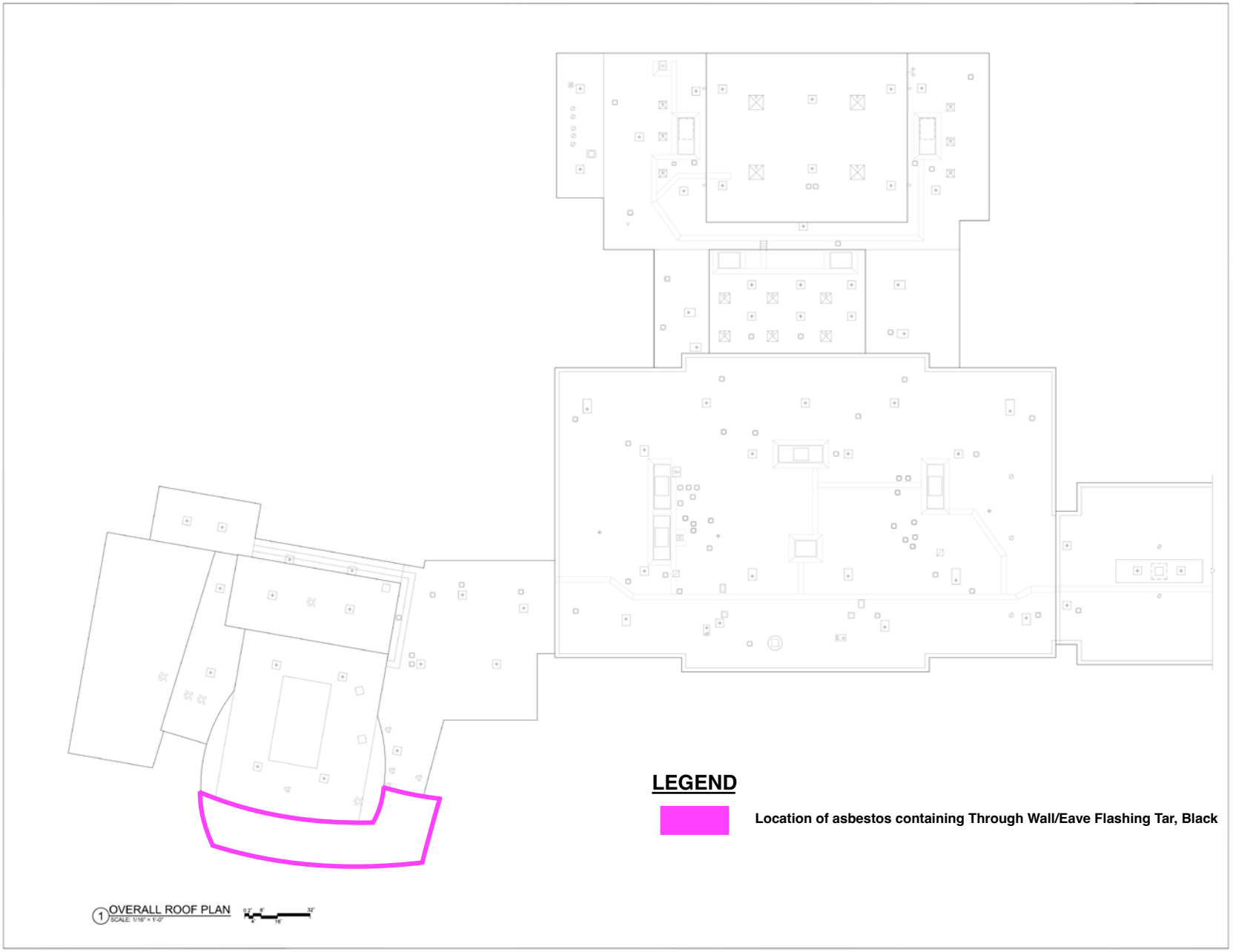

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ASBESTOS CONTAINING MATERIALS
LOCATION PLAN

NOT TO SCALE
Date: 09/2023
By: Drew Cheskin

DRAWING 2 of 2

Appendix D

Lead XRF Results

ENVIROSCIENCE CONSULTANTS
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Lead XRF Inspection Report

Client: Brewster Central School District	Date: September 15, 2023
Project: Brewster CSD District Wide Hazardous Material Inspections (Package I)	Job #: 24040
Inspector Name: Wade Coble	Signature: *Wade Coble* XRF Serial Number: 2819

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
1	-	-	-	Calibration Check	1.2	-
2	-	-	-	Calibration Check	1.2	-
3	-	-	-	Calibration Check	1.2	-
4	-	-	-	Calibration Check	0	-
5	-	-	-	Calibration Check	-0.1	-
6	-	-	-	Calibration Check	0.1	-
7	Metal	Hand Railing	Grey	Structural Bridge A	0	Negative
8	Concrete	Wall	Tan	Structural Bridge A	0.3	Negative
9	Concrete	Ceiling	White	Structural Bridge A	0.4	Negative
10	Concrete	Wall	White	Structural Bridge A	0.3	Negative
11	Concrete	Wall	White	Structural Bridge A	0.4	Negative
12	Concrete	Wall	White	Structural Bridge A	0.3	Negative
13	Concrete	Wall	White	Structural Bridge A	0.3	Negative
14	Concrete	Wall	White	Structural Bridge A	0.4	Negative
15	Metal	Hand Railing	Grey	Structural Bridge B	0.2	Negative

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
16	Metal	Hand Railing	Grey	Structural Bridge B	0.4	Negative
17	Concrete	Wall	Pink	Structural Bridge B	0.2	Negative
18	Concrete	Ceiling	White	Structural Bridge B	0.3	Negative
19	Concrete	Wall	White	Structural Bridge B	0.4	Negative
20	Concrete	Wall	White	Structural Bridge B	0	Negative
21	Concrete	Wall	White	Structural Bridge B	0.5	Negative
22	Concrete	Wall	White	Structural Bridge B	0.1	Negative
23	Concrete	Wall	White	Structural Bridge B	0.2	Negative
24	Metal	Access Panel Door	White	Boy's Locker Room Shower	0.1	Negative
25	Metal	Access Panel Door	White	Girl's Locker Room Shower	0	Negative
26	Gypsum	Ceiling	White	Girl's Locker Room Shower	0.1	Negative
27	Gypsum	Ceiling	White	Girl's Locker Room Shower	0.1	Negative
28	Gypsum	Ceiling	White	Girl's Locker Room Shower	0.1	Negative
29	Gypsum	Ceiling	White	Girl's Locker Room Shower	0.1	Negative
30	Gypsum	Ceiling	White	Girl's Locker Room Shower	0.1	Negative
31	Gypsum	Ceiling	White	Girl's Locker Room Shower	0.1	Negative
32	Gypsum	Ceiling	White	Girl's Locker Room Shower	0.1	Negative
33	Gypsum	Ceiling	White	Girl's Locker Room Shower	0.1	Negative
34	Metal	Entry Door Buck	Brown	Main Entrance Foyer	0	Negative
35	Metal	Entry Door	Brown	Main Entrance Foyer	0.1	Negative
36	Metal	Window Jamb	Brown	Main Entrance Foyer	0.3	Negative

Sample ID #	Substrate	Component	Color	Test Location	XRF mg/cm2	Classification
37	Metal	Window Casing	Brown	Main Entrance Foyer	0.2	Negative
38	Metal	Ceiling	Brown	Main Entrance Foyer	0.3	Negative
39	Gypsum	Ceiling	Cream	Main Entrance Foyer	0.1	Negative
40	Metal	Inside Door Buck	Brown	Main Entrance Foyer	0.1	Negative
41	Metal	Inside Door	Brown	Main Entrance Foyer	0.1	Negative
42	Metal	Window Jamb	Brown	Main Entrance Security Hallway	0.2	Negative
43	Metal	Window Jamb	Brown	Main Entrance Security Hallway	0	Negative
44	Metal	Window Jamb	Brown	Main Entrance Security Hallway	0	Negative
45	Metal	Window Jamb	Brown	Main Entrance Security Hallway	0.1	Negative
46	Metal	Window Casing	Brown	Main Entrance Security Hallway	0	Negative
47	Metal	Window Casing	Brown	Main Entrance Security Hallway	0.2	Negative
48	Metal	Window Casing	Brown	Main Entrance Security Hallway	0.1	Negative
49	Metal	Window Casing	Brown	Main Entrance Security Hallway	0	Negative
50	Metal	Window Casing	Brown	Main Entrance Security Hallway	0	Negative
51	Metal	Window Casing	Brown	Main Entrance Security Hallway	0	Negative
52	-	-	-	Calibration Check	1.2	-
53	-	-	-	Calibration Check	1.2	-
54	-	-	-	Calibration Check	1.2	-
55	-	-	-	Calibration Check	0	-
56	-	-	-	Calibration Check	-0.1	-
57	-	-	-	Calibration Check	0.1	-

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.: 235062-26562

Customer: Enviroscience Consultants, Inc.
2150 Smithtown Avenue
Ronkonkoma, NY 11779

Project: Brewster HS; 50 Foggintown Rd Brewster, NY

Lab Sample ID: 230919O162 **Collected:** 9/19/2023
Client ID: 1 **Received:** 9/19/2023
Description: PAC Roof, Eave Flashing Caulk, Gray

Parameter	Method	Analysis Date	LOQ	Result	MCL	Units	Flag(s)
PCB 1016	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
PCB 1221	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
PCB 1232	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
PCB 1242	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
PCB 1248	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
PCB 1254	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
PCB 1260	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
PCB 1262	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
PCB 1268	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
Total PCBs	EPA 8082A	09/25/23	0.760	<0.760	50.0	mg/kg	
Extraction	EPA 3546	09/20/23		Complete			

Lab Sample ID: 230919O163 **Collected:** 9/19/2023
Client ID: 2 **Received:** 9/19/2023
Description: Main Entrance Facades, Expansion Joint Caulk, Light Brown

Parameter	Method	Analysis Date	LOQ	Result	MCL	Units	Flag(s)
PCB 1016	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
PCB 1221	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
PCB 1232	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
PCB 1242	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
PCB 1248	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
PCB 1254	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
PCB 1260	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
PCB 1262	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
PCB 1268	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
Total PCBs	EPA 8082A	09/25/23	0.992	<0.992	50.0	mg/kg	
Extraction	EPA 3546	09/20/23		Complete			

NYSDOH ELAP Lab ID 11510

Approved: _____
Li Tsang, Laboratory Director

Lab Sample ID:	230919O164	**Collected:**	9/19/2023
Client ID:	3	**Received:**	9/19/2023
Description:	Main Entrance Storefront / Windows, Ext Door / Window Frame Caulk, Dark Brown		

Parameter	Method	Analysis Date	LOQ	Result	MCL	Units	Flag(s)
PCB 1016	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
PCB 1221	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
PCB 1232	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
PCB 1242	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
PCB 1248	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
PCB 1254	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
PCB 1260	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
PCB 1262	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
PCB 1268	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
Total PCBs	EPA 8082A	09/25/23	0.746	<0.746	50.0	mg/kg	
Extraction	EPA 3546	09/20/23		Complete			

Comment(s):

LOQ: Limit of Quantitation PCB: Polychlorinate biphenyl MCL: Maximum Contaminant Limit

Samples analyzed on a wet-weight, "as-received" basis.

NYSDOH ELAP Lab ID 11510

Approved: _____

Li Tsang, Laboratory Director

75495

NEW YORK ENVIRONMENTAL

Q309190162-0164

88 Harbor Road
Port Washington, NY 11050
(516) 944-9500 • Fax (516) 944-9507
www.nyenvironmental.com

Client Brewster CSD	Client Proj. # 24040	Date 9/19/23
Project Fuller D'Angelo P1	Address Brewster HS, 50 Foggintown Rd, Brewster, NY	
Technician Drew Cheskin	Turnaround 5-Day	Lab Use Only

Sample #	Location and/or Sample Description	Material	PCB ID	Result (mg/kg)	MDL
01	PAC Roof	Eave Flashing Caulk, Gray	ND	<0.760	0.760
02	Main Entrance facades	Expansion Joint Caulk, Light Brown	ND	<0.992	0.992 AL
03	Main Entrance Storefront/Windows	Ext. Door/Window Frame Caulk, Dark Brown	ND	<0.745	0.745

Q350602

C 2 6 5 6 2

Relinquished: D Cheskin Signature: Date: 9/19/23 Time:

Received: S Emmel Signature: S Emmel Date: 9/19/23 Time: 1330

Lab Use Only:

NYEA #.	Analyst Initials AL	Analysis Date: 09/25/2023

Email Results to: @

Appendix F

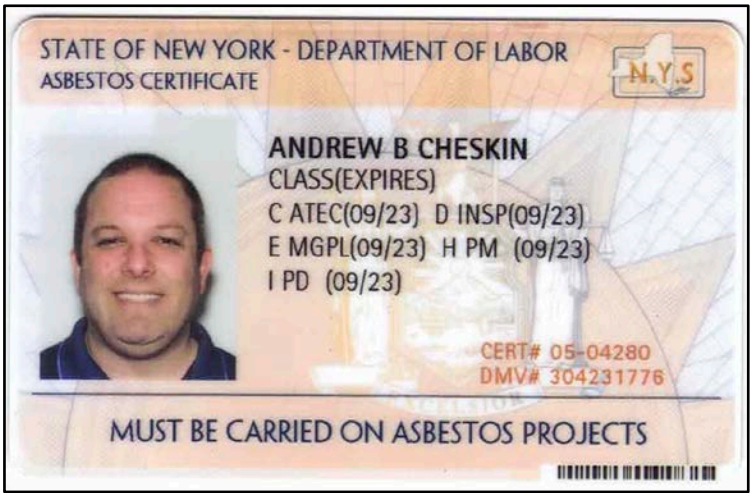
Photo Log

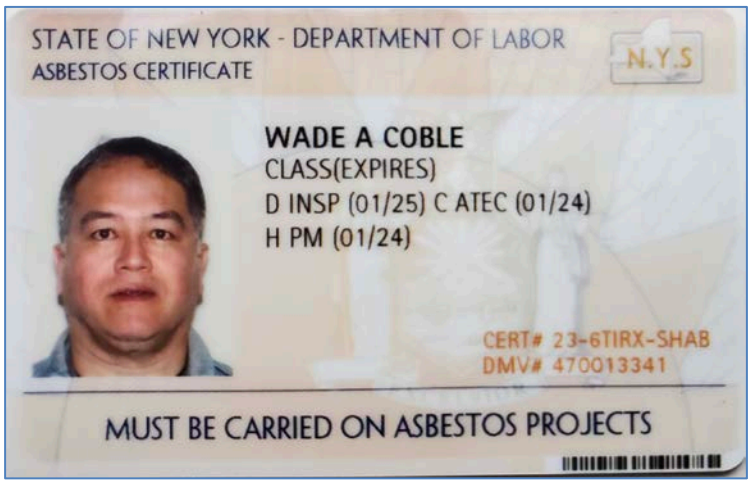
Asbestos containing Through Wall/Eave Flashing Tar, Black (PAC/Main Entrance Overhang Roof)

Asbestos containing Expansion Joint Tar, Black (Structural Bridges)

Appendix G

Certifications


STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE
N.Y.S
ANDREW B CHESKIN
CLASS(EXPIRES)
C ATEC(09/23) D INSP(09/23)
E MGPL(09/23) H PM (09/23)
I PD (09/23)
CERT# 05-04280
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

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, Ronkonkoma, NY, 11779

License Number: 28733
License Class: RESTRICTED
Date of Issue: 11/04/2022
Expiration Date: 11/30/2023
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

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

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 2022-10-01 through 2023-09-30

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).

2022-10-01 through 2023-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program

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

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, 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

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

NELAP RECOGNIZED TNI ACCREDITATION BODY

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