SED NO. 60-01-01-06-0-001-020

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WAVERLY CENTRAL SCHOOL DISTRICT

WAVERLY, NEW YORK

PROJECT NO. 339070-25002

PHASE 2

ADDITIONS AND ALSTERATIONS TO ELM STREET ELEMENTARY SCHOOL

February 23, 2026

The engineer that has signed this document certifies that to the best of their knowledge, information and belief, the asbestos plans and specifications are in accordance with applicable requirements of the New York State Uniform Fire Prevention and Building Code, Construction Standards of the Commissioner of Education, New York State Department of Labor Part 56 of Title 12, and the United States Environmental Protection Agency Hazard Emergency Response ACT Regulations. Kevin C. Terry is accredited to the EPA and New York State under AHERA Regulations as an Asbestos Project Designer (Asbestos Handling Certificate Number 14-20336).

To the best of the Architect's knowledge, information and belief, the design of this project conforms to all applicable provisions of the New York State Uniform Fire Prevention and Building Code, the New York State Energy Conservation Construction Code, and the building standards of the New York State Education Department. It is a violation of the Education Law of the State of New York for any person to alter or modify this document in any way unless acting under the direction of a professional architect.

RE-BID SET

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01 31 00	Project Management and Coordination (with two attachments)
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BP500	Details and Schedules

All drawings dated February 23, 2026.

NOTICE TO BIDDERS

NOTICE IS HEREBY GIVEN, that sealed Bids, in duplicate, are sought and requested by the Board of Education, Waverly Central School District (hereinafter called "Owner"), for the Additions and Alterations to Elm Street Elementary School.

Separate Bids are requested for the following Contracts:

General
Plumbing
Mechanical
Electrical

in accordance with the Drawings, Project Manual (including Conditions of the Contract and Specifications), and other Bidding and Contract Documents prepared by:

Tetra Tech Engineers, Architects & Landscape Architects, P.C. d/b/a
Tetra Tech Architects & Engineers
10 Brown Road
Ithaca, New York 14850

A pre-bid conference for potential Bidders and other interested parties will be held on October 21, 2026, 4:00 PM local time, at Elm Street Elementary School, 145 Elm Street, Waverly, New York, 14892.

Sealed Bids will be received by the Owner until November 12, 2026, 4:00 PM local time at the Waverly Central School District Office, 45 Lincoln Street, Waverly, New York 14892. Bids received will be publicly opened and read aloud immediately following at the Construction Office, 45 Lincoln Street, Waverly, New York 14892.

For the convenience of potential Bidders and other interested parties, the Bidding Documents may be examined at the following locations:

Construction Market Data, 30 Technology Parkway South, Suite 100, Norcross, Georgia 30092-2912
Eastern Contractors Association, Inc., 6 Airline Drive, Colonie, New York 12205
Mohawk Valley Builders Exchange, 10 Main Street, Suite 202, Whitesboro, New York 13492
Northern New York Builders Exchange, 22074 Fabco Road, Watertown, New York 13601
The Builders Exchange of the Southern Tier, Inc.-East, 15 Belden Street, Binghamton, New York 13903
Construction Exchange of Buffalo & Western NY, 2660 William Street, Cheektowaga, New York 14227
Rochester Builders Exchange, 180 Linden Oaks, Suite 100, Rochester, New York 14625
Syracuse Builders Exchange, 6563 Ridings Rd., Syracuse, New York 13206
McGraw Hill Construction/Dodge, c/o Dataflow, 2215 Central Ave, Schenectady New York 12304
The Builders Exchange of the Southern Tier, Inc.-West, 65 E. Main. St., Falconer, New York 14733
Waverly Central School District, 45 Lincoln Street, Waverly, New York 14892.
Tetra Tech Architects & Engineers, 10 Brown Road, Ithaca, New York 14850

Complete digital sets of Bidding Documents, drawings and specifications, may be obtained online as an electronic download at www.syracuseblueprintplanroom.com 'public projects' for a non-refundable fee of $25.00 (Twenty-Five Dollars).

Complete hard copy sets of Bidding Documents, drawings and specifications, may be obtained online at www.syracuseblueprintplanroom.com 'public projects'. Checks shall be made payable to Waverly Central School District in the sum of $100.00 (One Hundred Dollars) for each set of documents. Mail checks to Syracuse Blue Print Co., Inc., 825 East Genesee Street, Syracuse, New York 13210. Plan deposit is refundable in accordance with the terms in the Instructions to Bidders. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs (either by providing FedEX/UPS account number or being charged a flat rate by the printer).

Please note www.syracuseblueprintplanroom.com is the designated location and means for distributing and obtaining all bid package information, electronic or hard copy. Only those Contract Documents obtained in this manner will enable a prospective bidder to be identified as a registered plan holder. 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.

All bid addenda will be transmitted to registered plan holders, regardless of receiving electronic or hard copy Bid Documents, via email and will be available at www.syracuseblueprintplanroom.com. Registered 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 Syracuse Blue Print Company 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.

As bid security, each Bid shall be accompanied by a certified check or Bid Bond made payable to the Owner, in accordance with the amounts and terms described in the Instructions to Bidders.

The Owner requires Bids comply with bidding requirements indicated in the Instructions to Bidders. The Owner may, at its discretion, waive informalities in Bids, but is not obligated to do so, nor does it represent that it will do so. The Owner also reserves the right to reject any and all Bids. The Owner will not waive informalities which would give one Bidder substantial advantage or benefit not enjoyed by all affected Bidders. Bids may not be withdrawn before 45 days following the Bid opening thereof, unless an error is claimed by the Bidder in accordance with the Instructions to Bidders.

INSTRUCTIONS TO BIDDERS

ARTICLE 1
PROJECT AND BIDDING INFORMATION

1. Project Identification: Additions and Alterations to Elm Street Elementary School.

    a. Project Location:

        1) 145 Elm Street, Waverly, New York, 14892.

2. Owner: Waverly Central School District.

    a. Address: 45 Lincoln Street, Waverly, New York 14892.

3. Bid Opening: Bids will be received until the following Bid opening date and time, at the following location:

    a. Bid Opening Date and Time: November 12, 2026, 4:00 PM, local time.

    b. Bid Opening Location: Waverly Central School District Office, 45 Lincoln Street, Waverly, New York 14892. Bids received will be publicly opened and read aloud immediately following at the Construction Office, 45 Lincoln Street, Waverly, New York 14892.

4. Bidders are invited to submit Bids for any, or all of, the following Contracts:

    a. General.
    b. Plumbing.
    c. Mechanical.
    d. Electrical.

5. Access to the Project Site: Subject to Owner's prior approval of timing, Bidders will be permitted access to Project site on Monday through Friday, from 7:00 AM until 4:00 PM, except legal holidays.

    a. Contact Owner's representative designated below, prior to visiting Project site, to arrange access.
    b. Owner's representative: LeChase, Russ Robinson 607-426-6921.

6. Pre-Bid Conference: A pre-bid conference for potential Bidders and other interested parties will be held as follows:

    a. Pre-Bid Conference Date and Time: October 21, 2026, 4:00 PM, local time.
    b. Pre-Bid Conference Location: Elm Street Elementary School, 145 Elm Street, Waverly, New York 14892.

7. Agreement Form: The following will be used as the basis for the form of agreement between the Owner and the Contractor (Owner-Contractor Agreement):

    a. Standard Form of Agreement Between Owner and Contractor, AIA Document A132.

ARTICLE 2
DEFINITIONS

1. Definitions in the General Conditions of the Contract for Construction, AIA Document A232, or in other Contract Documents are applicable to the Bidding Documents.

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

    b. "Bid": Complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

        1) "Base Bid": Sum stated in the Bid for which Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated for Alternates.

        2) "Alternates": Amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

    c. "Bidder": Person or entity who submits a Bid.

ARTICLE 3
BIDDING PROCEDURES

1. Bid Form: Complete the Bid Form provided, in duplicate, with all blank spaces for Base Bid and Alternates legibly completed in ink, or typewritten, in both words and figures.

    a. In the event of a discrepancy between amounts written in words and figures, the amount written in words shall govern.
    b. Bid Forms without amounts expressed both in words and figures will not be accepted.

2. Bid Attachments: Complete and submit the following attachments with the Bid Form:

    a. Attachment #1: Non-Collusive Bidding Certification.
    b. Attachment #2: Certified Corporate Resolution.
    c. Attachment #3: Iranian Energy Divestment Certification
    d. Attachment #4: Certificate on Violations

3. Bid Security:

    a. Submit, with the Bid Form, bid security in the amount of five percent of the Base Bid, in any of the following forms:

        1) Certified check, payable to the Owner; or

2) Bid Bond, payable to the Owner, on Bid Bond, AIA Document A310, or standard bid bond form, duly executed by the Bidder as principal, with a surety company acceptable to the Owner.

a) Affix a certified and current copy of the power of attorney for the attorney-in-fact who executes the required bond on behalf of the surety.

b. Within three days following the Bid opening, bid security will be returned to all Bidders, except the three apparent lowest Bidders.

1) Within three days following execution of the Owner-Contractor Agreement, bid security will be returned to the three apparent lowest Bidders.

2) If the Owner-Contractor Agreement has not been executed within 45 days following the Bid opening, bid security will be returned to the three apparent lowest Bidders, except as noted below.

c. Should the accepted Bidder, within 10 days following Notice of Award, fail or refuse to execute the Owner-Contractor Agreement and to provide the required performance and payment bonds, the accepted Bidder will be deemed to have abandoned the Contract and its bid security will be forfeited to the Owner.

4. Bid Withdrawal:

a. Bid may be withdrawn by the Bidder up until the date and time specified for opening of Bids.

b. Following the Bid opening, Bid may not be withdrawn before 45 days following the Bid opening, except in the case of Bidder error, as follows:

1) If the Bidder claims an error in the Bid, submit a written notice to the Architect, within three days of the Bid opening, describing in detail the nature of the error, submitting documentary evidence or proof of such error.

a) Failure to deliver such notice and evidence or proof, within the time frame required, constitutes a waiver of Bidder's right to claim error.

2) Upon receipt of required notice and evidence or proof, the Owner, in consultation with the Architect, will determine if an excusable error has been made; and if so, the Owner may permit the Bid to be withdrawn. The Owner's determination will be conclusive upon the Bidder, its surety, and all who claim rights under the Bidder.

ARTICLE 4
BIDDING DOCUMENTS

1. Bidding Documents include the bidding requirements and the proposed Contract Documents, as follows:

a. Bidding requirements consist of the following:

1) Notice to Bidders.
2) Instructions to Bidders.
3) Bid Form, with attachments.

4) Proposed Products Form.
5) Proposed Subcontractors Form.
6) Proposed Schedule of Values Form.
7) Bidder's Qualifications Form.

b. Proposed Contract Documents consist of the following:

1) Owner-Contractor Agreement.
2) Conditions of the Contract.
3) Drawings.
4) Specifications.
5) Addenda.

2. Bidding Document Interpretations or Corrections:

a. Submit requests for Bidding Document interpretation to the Architect, in writing using the provided Pre-Bid Request for Interpretation Form, at least five working days prior to the Bid opening.

b. Interpretations or corrections will be issued in the form of written Addenda. The Architect will not make oral interpretations or corrections.

c. Notification of addenda will be transmitted to registered plan holders via email and will be available to download at www.syracuseblueprintplanroom.com 'public projects'.

1) Failure of any Bidder to not download addenda and/or failure to receive any such Addendum by reason of not having registered as a plan holder in accordance with the bidding instructions, shall not relieve the Bidder from any obligation required by the Addendum.

3. Equivalents and Substitutions: The use of manufacturer's brand names, catalog numbers, and similar proprietary identifying data is intended to establish a standard of quality, appearance, and function for those items. It is not the intention of the Owner or the Architect to eliminate from consideration products that are equivalent in quality, appearance, and function to those identified.

a. Equivalents are pre-award and substitutions are post-award.

b. Equivalents:

1) On Proposed Products Form provided, as post-Bid information, identify and list proposed equivalents to specified products as follows:

a) Applicable Specification Section and paragraph.

b) Proposed manufacturer's name, product brand name, and catalog number of proposed equivalent.

c) Note any aspect of the specified product that the proposed equivalent cannot meet.

d) Note any impact that accepting the proposed equivalent would have on work by other Prime Contractors. Failure to identify any such impacts shall deem such impacts the responsibility of the Bidder; Bidder, if awarded the Contract, shall compensate the Owner for additional monies due other Prime Contractors due to the acceptance of the proposed equivalent.

2) Failure to identify and list proposed equivalents shall be deemed to mean the Bidder will furnish the materials or products indicated in the Contract Documents without exception.

c. Substitutions: Refer to Division 01 Specification Section "Substitution Procedures".

d. Note any impact that accepting the proposed equivalent would have on work by other Prime Contractors. Failure to identify any such impacts shall deem such impacts the responsibility of the Bidder; Bidder, if awarded the Contract, shall compensate the Owner for additional monies due other Prime Contractors due to the acceptance of the proposed equivalent.

4. Any required plan deposit shall be refunded to Bidders who submit a bona fide Bid and return the hard copy (paper) Bidding Documents in full, and in good condition within thirty days following the award of the contract or the rejection of the bids covered by such Bid Documents. If the Bid Documents are not returned in full, or in good condition, the cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded. Partial reimbursement, in an amount equal to the full amount of such deposit for one set of Bid Documents per non-bidder less the actual cost of reproduction of the Bid Documents as determined by the Architect, shall be made for the return of all other copies of the Bid Documents in good condition within thirty days following the award of the contract or the rejection of the bids covered by such Bid Documents. If the Bid Documents are not returned in full, or in good condition, the cost to replace missing or damaged paper documents will be deducted from the deposit.

ARTICLE 5
BIDDER'S REPRESENTATIONS

1. By submitting a Bid, Bidder represents that:

a. Bidder has visited and thoroughly inspected the Project site, and has become fully informed of the conditions relating to the Project;

b. Bidder has received, read, and is thoroughly familiar with the Bidding Documents, including all Addenda issued; and

c. Bidder has prepared its Bid based on the materials, equipment and systems required by the Bidding Documents or equivalents.

e. The Bidder and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements. https://dol.ny.gov/contractor-and-subcontractor-landing

1) Bidders are required to submit with their bid proof of registration as required by Labor Law Section 220-i as a minimum qualification. Failure to provide such proof of registration will disqualify a bidder.

ARTICLE 6
BID CONSIDERATION

1. Opening of Bids: At the designated Bid opening date and time, Bids received will be publicly opened and read aloud.

2. Bid Rejection:

    a. The Owner requires Bids comply with bidding requirements; however, the Owner may, at its discretion, waive informalities in Bids. The Owner is not obligated to do so and does not represent that it will do so. The Owner will not waive informalities which would give one Bidder substantial advantage or benefit not enjoyed by all affected Bidders.

    b. The Owner reserves the right to reject any and all Bids not deemed in the best interests of the Owner, if in its judgment the public interest will be promoted thereby.

    c. The Owner reserves the right to reject as "informal" any and all Bids which, in its opinion, are incomplete, conditional, obscure, or contain irregularities of any kind.

    d. In rejecting a Bid, the Owner does not forfeit its right to accept the Bid for any other Contract contained in the Project; and the rejection of a Bid is not necessarily a finding by the Owner of any facts or circumstances which would preclude the Bidder from serving as a subcontractor on any portion of the Project.

3. Bid Acceptance: The Owner intends to award the Contract to the responsible Bidder whose Bid complies with conditions to render it formal, who is able to furnish approved surety bonds, and whose Bid is the lowest number of dollars as defined below.

    a. Lowest Bid may be Base Bid plus any Alternates the Owner desires to accept.
    b. If the acceptance of Alternates does not change the low Bidder, the Owner reserves the right to accept any or all Alternates within 45 days following Notice of Award.

ARTICLE 7
POST-BID INFORMATION

1. Contractor Qualifications: The Owner may make such investigations as it deems necessary to determine the ability of the Bidder to perform the Work.

    a. The Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request, including the provided Bidder's Qualifications Form.

    b. The Owner reserves the right to reject any Bid if the evidence submitted, or investigation of Bidder fails to satisfy the Owner that the Bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

2. Owner's Financial Capability: Successful Bidder may submit request to Owner for information regarding Owner's financial arrangements for this Project in accordance with the General Conditions, no later than 30 days following the Bid opening.

3. Post-Bid Submittals:

    a. The three apparent low Bidders shall submit the following completed forms within three days following the Bid opening:

        1) Proposed Products Form.
        2) Proposed Subcontractors Form.
        3) Proposed Schedule of Values Form.
        4) Upon request, Bidder's Qualifications Form.

ARTICLE 8
PERFORMANCE BOND AND PAYMENT BOND

1. Bond Requirements:

    a. The successful Bidder shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder.

    b. Bonds shall be obtained from a surety satisfactory to the Owner, authorized and licensed to do business in the state where the Project is located, and listed in the latest issue of the U.S. Treasury Circular 570. The amount of each bond shall be equal to 100 percent of the Contract Sum. The sufficiency of the bonds is subject to the approval of the Owner and bonds deemed insufficient by the Owner may be rejected.

    c. Affix a certified and current copy of the power of attorney for the attorney-in-fact who executes the required bonds on behalf of the surety.

2. Time of Delivery and Form of Bonds:

    a. Deliver required bonds to the Owner not later than the date the Agreement in entered into.
    b. Use Performance Bond and Payment Bond, AIA Document A312, unless otherwise approved by the Owner.

ARTICLE 9
MISCELLANEOUS PROVISIONS

1. All applicable laws, ordinances, rules, and regulations of Federal, State, and other authorities having jurisdiction over the Project shall apply to the Contract throughout, and will be deemed included in the Contract as though herein written out in full.

    a. Sections of the New York State Labor Law (LL) and the New York State General Municipal Law (GML) include, but are not limited to, the following:

        1) LL §220, subd. 2: Eight-hour day, 40-hour week.
        2) LL §220, subd. 3 and LL §220-d: Minimum rate of wage and supplement.
        3) LL §220-e: Prohibiting discrimination.
        4) LL §222-a: Prevention of dust hazards.
        5) GML §103-d: Statement of non-collusion in bids.
        6) GML §106-b: Payment on public work contracts.
        7) GML §108: Workmen's compensation insurance.
        8) GML §109: Assignment of public contracts.

2. Time of Completion: Refer to Division 01 Section “Multiple Contract Summary – Project Schedule”.

Attachment: Pre-Bid Request for Interpretation Form

END OF SECTION 00 21 13

TETRA TECH
ARCHITECTS & ENGINEERS

INSTRUCTIONS TO BIDDERS
ATTACHMENT #1:
PRE-BID REQUEST FOR INTERPRETATION FORM

SUBMIT FORM BY EMAIL TO INE.Waverly@tetratech.com

Project No.: 339070-25002 **Date:**

Project Name: Additions and Alterations to Elm Street Elementary School Phase 2 – Re-Bid

---

Bidder Contact Person:
Bidder Company Name:
Bidder Phone:
Bidder Email Address:

Question Pertains to:

Drawing Number:
Plan Area:
Room Number:
Drawing Detail Number:
Specification Section:

Question: (Please be specific)

Review by Architect/Engineers: **Responded By:** _____ **Date:** _____

Submit requests not less than 5 working days prior to the specified Bid Opening date and time. In the event that this question requires clarification or modification of the Bidding Documents, such written information can only be provided by formal Addendum, distributed to all plan holders.

TETRA TECH
ARCHITECTS & ENGINEERS

10 Brown Road
Ithaca NY 14850

Ithaca, New York
Farmingdale, New York
Albany, New York

BID FROM (Bidder's Name) : _____

(Address) : _____

_____

Bidder's Telephone : _____

Bidder's Facsimile (Fax) : _____

Bidder's E-mail Address (if applicable) : _____

BID FORM
(submit in duplicate)

CONTRACT: GENERAL CONTRACT

PROJECT TITLE: ADDITIONS AND ALTERATIONS TO ELM STREET ELEMENTARY SCHOOL PHASE 2 RE-BID

PROJECT NO.: 339070-25002

BID TO: WAVERLY CENTRAL SCHOOL DISTRICT
45 LINCOLN STREET
WAVERLY NEW YORK 14892

The Bidder hereby certifies that it has examined and fully understands the requirements and intent of the Bidding Documents, including the Bidding Requirements and proposed Contract Documents; and proposes to furnish all labor, materials, and equipment necessary to complete the Work on, or before, the dates specified in the Contract Documents for the **BASE BID** sum of:

_____
(words)

_____ ($_____)
(figures)

Show all amounts in both words and figures; in the event of a discrepancy between amounts written in words and figures, the amount written in words shall govern.

Refer to Division 01 Section "Allowances" for description of allowances to be included in the Base Bid above.

ALLOWANCES

Indicate in the spaces provided below the amount(s) that were added to the Base Bid for Division 01 Section "Allowances".

ALLOWANCE NO. GC-01: Contingency Allowance:

ADDED to the Base Bid the sum of:

_____ ($_____)

(words) (figures)

ALTERNATES

Indicate in the spaces provided below the amount to be added to or the amount to be deducted from (as applicable) the Base Bid if the Owner accepts the following Alternates described in Division 01 Section "Alternates".

Include in the amount of each Alternate, all labor, materials, overhead and profit, modification of Work specified in the Contract Documents, and additional work that may be required by acceptance of the Alternate.

ALTERNATE NO. 01 – Additional Acoustic Wall Panels:

ADD to the Base Bid the sum of:

_____ ($_____)
(words) (figures)

OR

DEDUCT from the Base Bid the sum of:

_____ ($_____)
(words) (figures)

ALTERNATE NO. 02 – Exterior Ramp:

ADD to the Base Bid the sum of:

_____ ($_____)
(words) (figures)

OR

DEDUCT from the Base Bid the sum of:

_____ ($_____)
(words) (figures)

ALTERNATE NO. 03 – Parking Lot Renovations:

ADD to the Base Bid the sum of:

_____ ($_____)
(words) (figures)

OR

DEDUCT from the Base Bid the sum of:

_____ ($_____)
(words) (figures)

LIST OF ADDENDA RECEIVED

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

BID ATTACHMENTS

Enclosed with this Bid are the following attachments:

Attachment #1 - Non-Collusive Bidding Certification.
Attachment #2 - Certified Corporate Resolution.
Attachment #3 – Iranian Energy Divestment Certification
Attachment #4 – Certification on Violations
Attachment #5 – Bidder's Statement on Sexual Harassment

BID SECURITY

Enclosed with this Bid is bid security in the amount of five percent of the Base Bid.

PUBLIC WORK CONTRACTOR AND SUBCONTRACTOR REGISTRY

The Bidder hereby certifies that the Bidder and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements. **Bidders are required to attach to this bid form proof of registration as required by Labor Law Section 220-i as a minimum qualification and failure to provide proof of registration will disqualify a bidder.**

EXECUTION OF CONTRACT

If written notice of the acceptance of this Bid is transmitted to the undersigned within 45 days following the Bid opening, the undersigned will, within 10 days following the Notice of Award, execute and transmit a Contract in the form as required by the Architect.

This Bid may be withdrawn at any time prior to the Bid opening.

SIGNATURE

( ) NAME OF BIDDER (Corporate Name)
( )
( ) _____
(Corporate Seal)
( ) SIGNATURE (Corporate Officer)
( )
( ) _____
( )
( ) DATE: _____

BID FORM
ATTACHMENT #1

GENERAL CONDITIONS TO BID
NON-COLLUSIVE BIDDING CERTIFICATION

No bid will be accepted that does not have this form completely executed.

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

(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 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;

(d) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as to the person signing in its behalf;

(e) That attached hereto (if corporate bidder) is a certified copy of resolution authorizing the execution of this certified by the signature of this bid or proposal in behalf of the corporate bidder.

_____
(Individual)

_____
(Corporation)

Dated:_____ By _____
(Signature of Officer)

This Non-Collusive Bidding Certificate must be submitted with the bid.

BID FORM
ATTACHMENT #2

CERTIFIED CORPORATE RESOLUTION

RESOLVED THAT _____ be authorized to sign and submit the bid or proposal of this corporation for the following project:

_____

_____

and to include in such bid or proposal the certificate as to non-collusion required by section one hundred three-d (103-d) of the general municipal law as to the act and deed of such corporation, and for any inaccuracies or mis-statements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution and adopted by

_____ at a meeting of its board of directors held on the

_____ day of _____ 20__ .

_____
(Secretary)

BID FORM
ATTACHMENT #3

IRANIAN ENERGY DIVESTMENT CERTIFICATION

Pursuant to Section 103-g
Of the New York State
General Municipal Law

A. By submission of this bid/proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the New York State Finance Law.

B. A Bid/Proposal shall not be considered for award, nor shall any award be made where the condition set forth in Paragraph A above has not been complied with; provided, however, that in any case the bidder/proposer cannot make the foregoing certification set forth in Paragraph A above, the bidder/proposer shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where Paragraph A above cannot be complied with, the Purchasing Unit to the political subdivision, public department, agency or official thereof to which the bid/proposal is made, or his designee, may award a bid/proposal, on a case by case business under the following circumstances:

1. The investment activities in Iran were made before April 12, 2012, the investment activities in Iran have not been expanded or renewed after April 12, 2012, and the Bidder/Proposer has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or

2. The political subdivision makes a determination that the goods or services are necessary for the political subdivision to perform its functions and that, absent such an exemption, the political subdivision would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

_____
Signature

_____
Title

_____ _____
Date Company

BID FORM
ATTACHMENT #4

CERTIFICATION ON VIOLATIONS

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

   ☐ True ☐ False

   If False is selected, information for questions 2 and 3 must be provided. If True is selected questions 2 and 3 are not applicable, continue to question 4.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

   _____

   _____

   _____

   _____

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

   _____

   _____

   _____

   _____

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

_____ _____
Name Title

Sworn to before me this _____day of _____, 20__.

_____
Notary Public

BID FORM
ATTACHMENT #5

BIDDER'S STATEMENT ON SEXUAL HARASSMENT

IN ACCORDANCE WITH NEW YORK STATE FINANCE LAW §139-l

In accordance with State Finance Law §139-l, which generally prohibits the District from entering into contracts pursuant to the bid process with persons who fail to submit a certification affirming compliance with New York Labor Law §201-g, the Bidder submits the following certification under the penalty of perjury:

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

Dated: _____, 20_____

_____
Name of Bidder

_____
Signature of Authorized Official

_____
Printed or Typed Name of Official and Title

Sworn to before me this

_____ day of _____,

_____
Notary Public

TETRA TECH
ARCHITECTS & ENGINEERS

10 Brown Road
Ithaca NY 14850

Ithaca, New York
Farmingdale, New York
Albany, New York

BID FROM (Bidder's Name) : _____

(Address) : _____

_____

Bidder's Telephone : _____

Bidder's Facsimile (Fax) : _____

Bidder's E-mail Address (if applicable) : _____

BID FORM
(submit in duplicate)

CONTRACT: PLUMBING CONTRACT

PROJECT TITLE: ADDITIONS AND ALTERATIONS TO ELM STREET ELEMENTARY SCHOOL PHASE 2 RE-BID

PROJECT NO.: 339070-25002

BID TO: WAVERLY CENTRAL SCHOOL DISTRICT
45 LINCOLN STREET
WAVERLY NEW YORK 14892

The Bidder hereby certifies that it has examined and fully understands the requirements and intent of the Bidding Documents, including the Bidding Requirements and proposed Contract Documents; and proposes to furnish all labor, materials, and equipment necessary to complete the Work on, or before, the dates specified in the Contract Documents for the **BASE BID** sum of:

_____
(words)

_____ ($_____)
(figures)

Show all amounts in both words and figures; in the event of a discrepancy between amounts written in words and figures, the amount written in words shall govern.

Refer to Division 01 Section "Allowances" for description of allowances to be included in the Base Bid above.

ALLOWANCES

Indicate in the spaces provided below the amount(s) that were added to the Base Bid for Division 01 Section "Allowances".

ALLOWANCE NO. PC-01: Contingency Allowance:

ADDED to the Base Bid the sum of:

_____ ($_____)

(words) (figures)

LIST OF ADDENDA RECEIVED

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

BID ATTACHMENTS

Enclosed with this Bid are the following attachments:

Attachment #1 - Non-Collusive Bidding Certification.
Attachment #2 - Certified Corporate Resolution.
Attachment #3 – Iranian Energy Divestment Certification
Attachment #4 – Certification on Violations
Attachment #5 – Bidder's Statement on Sexual Harassment

BID SECURITY

Enclosed with this Bid is bid security in the amount of five percent of the Base Bid.

PUBLIC WORK CONTRACTOR AND SUBCONTRACTOR REGISTRY

The Bidder hereby certifies that the Bidder and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements. **Bidders are required to attach to this bid form proof of registration as required by Labor Law Section 220-i as a minimum qualification and failure to provide proof of registration will disqualify a bidder.**

EXECUTION OF CONTRACT

If written notice of the acceptance of this Bid is transmitted to the undersigned within 45 days following the Bid opening, the undersigned will, within 10 days following the Notice of Award, execute and transmit a Contract in the form as required by the Architect.

This Bid may be withdrawn at any time prior to the Bid opening.

SIGNATURE

( ) NAME OF BIDDER (Corporate Name)
( )
( ) _____
(Corporate Seal)
( ) SIGNATURE (Corporate Officer)
( )
( ) _____
( )
( ) DATE: _____

BID FORM
ATTACHMENT #1

GENERAL CONDITIONS TO BID
NON-COLLUSIVE BIDDING CERTIFICATION

No bid will be accepted that does not have this form completely executed.

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

(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 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;

(d) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as to the person signing in its behalf;

(e) That attached hereto (if corporate bidder) is a certified copy of resolution authorizing the execution of this certified by the signature of this bid or proposal in behalf of the corporate bidder.

_____
(Individual)

_____
(Corporation)

Dated:_____ By _____
(Signature of Officer)

This Non-Collusive Bidding Certificate must be submitted with the bid.

BID FORM
ATTACHMENT #2

CERTIFIED CORPORATE RESOLUTION

RESOLVED THAT _____ be authorized to sign and submit the bid or proposal of this corporation for the following project:

_____

_____

and to include in such bid or proposal the certificate as to non-collusion required by section one hundred three-d (103-d) of the general municipal law as to the act and deed of such corporation, and for any inaccuracies or mis-statements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution and adopted by

_____ at a meeting of its board of directors held on the

_____ day of _____ 20__ .

_____
(Secretary)

BID FORM
ATTACHMENT #3

IRANIAN ENERGY DIVESTMENT CERTIFICATION

Pursuant to Section 103-g
Of the New York State
General Municipal Law

A. By submission of this bid/proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the New York State Finance Law.

B. A Bid/Proposal shall not be considered for award, nor shall any award be made where the condition set forth in Paragraph A above has not been complied with; provided, however, that in any case the bidder/proposer cannot make the foregoing certification set forth in Paragraph A above, the bidder/proposer shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where Paragraph A above cannot be complied with, the Purchasing Unit to the political subdivision, public department, agency or official thereof to which the bid/proposal is made, or his designee, may award a bid/proposal, on a case by case business under the following circumstances:

1. The investment activities in Iran were made before April 12, 2012, the investment activities in Iran have not been expanded or renewed after April 12, 2012, and the Bidder/Proposer has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or

2. The political subdivision makes a determination that the goods or services are necessary for the political subdivision to perform its functions and that, absent such an exemption, the political subdivision would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

_____
Signature

_____
Title

_____ _____
Date Company

BID FORM
ATTACHMENT #4

CERTIFICATION ON VIOLATIONS

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

   ☐ True ☐ False

   If False is selected, information for questions 2 and 3 must be provided. If True is selected questions 2 and 3 are not applicable, continue to question 4.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

   _____

   _____

   _____

   _____

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

   _____

   _____

   _____

   _____

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

_____ _____
Name Title

Sworn to before me this _____day of _____, 20__.

_____
Notary Public

BID FORM
ATTACHMENT #5

BIDDER'S STATEMENT ON SEXUAL HARASSMENT

IN ACCORDANCE WITH NEW YORK STATE FINANCE LAW §139-l

In accordance with State Finance Law §139-l, which generally prohibits the District from entering into contracts pursuant to the bid process with persons who fail to submit a certification affirming compliance with New York Labor Law §201-g, the Bidder submits the following certification under the penalty of perjury:

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

Dated: _____, 20_____

_____
Name of Bidder

_____
Signature of Authorized Official

_____
Printed or Typed Name of Official and Title

Sworn to before me this

_____ day of _____,

_____
Notary Public

TETRA TECH
ARCHITECTS & ENGINEERS

10 Brown Road
Ithaca NY 14850

Ithaca, New York
Farmingdale, New York
Albany, New York

BID FROM (Bidder's Name) : _____

(Address) : _____

_____

Bidder's Telephone : _____

Bidder's Facsimile (Fax) : _____

Bidder's E-mail Address (if applicable) : _____

BID FORM
(submit in duplicate)

CONTRACT: MECHANICAL CONTRACT

PROJECT TITLE: ADDITIONS AND ALTERATIONS TO ELM STREET ELEMENTARY SCHOOL PHASE 2 RE-BID

PROJECT NO.: 339070-25002

BID TO: WAVERLY CENTRAL SCHOOL DISTRICT
45 LINCOLN STREET
WAVERLY NEW YORK 14892

The Bidder hereby certifies that it has examined and fully understands the requirements and intent of the Bidding Documents, including the Bidding Requirements and proposed Contract Documents; and proposes to furnish all labor, materials, and equipment necessary to complete the Work on, or before, the dates specified in the Contract Documents for the **BASE BID** sum of:

_____
(words)

_____ ($_____)
(figures)

Show all amounts in both words and figures; in the event of a discrepancy between amounts written in words and figures, the amount written in words shall govern.

Refer to Division 01 Section "Allowances" for description of allowances to be included in the Base Bid above.

ALLOWANCES

Indicate in the spaces provided below the amount(s) that were added to the Base Bid for Division 01 Section "Allowances".

ALLOWANCE NO. MC-01: Contingency Allowance:

ADDED to the Base Bid the sum of:

_____ ($_____)

(words) (figures)

LIST OF ADDENDA RECEIVED

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

BID ATTACHMENTS

Enclosed with this Bid are the following attachments:

Attachment #1 - Non-Collusive Bidding Certification.
Attachment #2 - Certified Corporate Resolution.
Attachment #3 – Iranian Energy Divestment Certification
Attachment #4 – Certification on Violations
Attachment #5 – Bidder's Statement on Sexual Harassment

BID SECURITY

Enclosed with this Bid is bid security in the amount of five percent of the Base Bid.

PUBLIC WORK CONTRACTOR AND SUBCONTRACTOR REGISTRY

The Bidder hereby certifies that the Bidder and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements. **Bidders are required to attach to this bid form proof of registration as required by Labor Law Section 220-i as a minimum qualification and failure to provide proof of registration will disqualify a bidder.**

EXECUTION OF CONTRACT

If written notice of the acceptance of this Bid is transmitted to the undersigned within 45 days following the Bid opening, the undersigned will, within 10 days following the Notice of Award, execute and transmit a Contract in the form as required by the Architect.

This Bid may be withdrawn at any time prior to the Bid opening.

SIGNATURE

( ) NAME OF BIDDER (Corporate Name)
( )
( ) _____
(Corporate Seal)
( ) SIGNATURE (Corporate Officer)
( )
( ) _____
( )
( ) DATE: _____

BID FORM
ATTACHMENT #1

GENERAL CONDITIONS TO BID
NON-COLLUSIVE BIDDING CERTIFICATION

No bid will be accepted that does not have this form completely executed.

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

(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 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;

(d) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as to the person signing in its behalf;

(e) That attached hereto (if corporate bidder) is a certified copy of resolution authorizing the execution of this certified by the signature of this bid or proposal in behalf of the corporate bidder.

_____
(Individual)

_____
(Corporation)

Dated:_____ By _____
(Signature of Officer)

This Non-Collusive Bidding Certificate must be submitted with the bid.

BID FORM
ATTACHMENT #2

CERTIFIED CORPORATE RESOLUTION

RESOLVED THAT _____ be authorized to sign and submit the bid or proposal of this corporation for the following project:

_____

_____

and to include in such bid or proposal the certificate as to non-collusion required by section one hundred three-d (103-d) of the general municipal law as to the act and deed of such corporation, and for any inaccuracies or mis-statements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution and adopted by

_____ at a meeting of its board of directors held on the

_____ day of _____ 20__ .

_____
(Secretary)

BID FORM
ATTACHMENT #3

IRANIAN ENERGY DIVESTMENT CERTIFICATION

Pursuant to Section 103-g
Of the New York State
General Municipal Law

A. By submission of this bid/proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the New York State Finance Law.

B. A Bid/Proposal shall not be considered for award, nor shall any award be made where the condition set forth in Paragraph A above has not been complied with; provided, however, that in any case the bidder/proposer cannot make the foregoing certification set forth in Paragraph A above, the bidder/proposer shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where Paragraph A above cannot be complied with, the Purchasing Unit to the political subdivision, public department, agency or official thereof to which the bid/proposal is made, or his designee, may award a bid/proposal, on a case by case business under the following circumstances:

1. The investment activities in Iran were made before April 12, 2012, the investment activities in Iran have not been expanded or renewed after April 12, 2012, and the Bidder/Proposer has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or

2. The political subdivision makes a determination that the goods or services are necessary for the political subdivision to perform its functions and that, absent such an exemption, the political subdivision would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

_____
Signature

_____
Title

_____ _____
Date Company

BID FORM
ATTACHMENT #4

CERTIFICATION ON VIOLATIONS

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

   ☐ True ☐ False

   If False is selected, information for questions 2 and 3 must be provided. If True is selected questions 2 and 3 are not applicable, continue to question 4.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

   _____

   _____

   _____

   _____

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

   _____

   _____

   _____

   _____

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

_____ _____
Name Title

Sworn to before me this _____day of _____, 20__.

_____
Notary Public

BID FORM
ATTACHMENT #5

BIDDER'S STATEMENT ON SEXUAL HARASSMENT

IN ACCORDANCE WITH NEW YORK STATE FINANCE LAW §139-l

In accordance with State Finance Law §139-l, which generally prohibits the District from entering into contracts pursuant to the bid process with persons who fail to submit a certification affirming compliance with New York Labor Law §201-g, the Bidder submits the following certification under the penalty of perjury:

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

Dated: _____, 20_____

_____
Name of Bidder

_____
Signature of Authorized Official

_____
Printed or Typed Name of Official and Title

Sworn to before me this

_____ day of _____,

_____
Notary Public

TETRA TECH
ARCHITECTS & ENGINEERS

10 Brown Road
Ithaca NY 14850

Ithaca, New York
Farmingdale, New York
Albany, New York

BID FROM (Bidder's Name) : _____

(Address) : _____

_____

Bidder's Telephone : _____

Bidder's Facsimile (Fax) : _____

Bidder's E-mail Address (if applicable) : _____

BID FORM
(submit in duplicate)

CONTRACT: ELECTRICAL CONTRACT

PROJECT TITLE: ADDITIONS AND ALTERATIONS TO ELM STREET ELEMENTARY SCHOOL PHASE 2 RE-BID

PROJECT NO.: 339070-25002

BID TO: WAVERLY CENTRAL SCHOOL DISTRICT
45 LINCOLN STREET
WAVERLY NEW YORK 14892

The Bidder hereby certifies that it has examined and fully understands the requirements and intent of the Bidding Documents, including the Bidding Requirements and proposed Contract Documents; and proposes to furnish all labor, materials, and equipment necessary to complete the Work on, or before, the dates specified in the Contract Documents for the **BASE BID** sum of:

_____
(words)

_____ ($_____)
(figures)

Show all amounts in both words and figures; in the event of a discrepancy between amounts written in words and figures, the amount written in words shall govern.

Refer to Division 01 Section "Allowances" for description of allowances to be included in the Base Bid above.

ALLOWANCES

Indicate in the spaces provided below the amount(s) that were added to the Base Bid for Division 01 Section "Allowances".

ALLOWANCE NO. EC-01: Contingency Allowance:

ADDED to the Base Bid the sum of:

_____ ($_____)

(words) (figures)

ALTERNATES

Indicate in the spaces provided below the amount to be added to or the amount to be deducted from (as applicable) the Base Bid if the Owner accepts the following Alternates described in Division 01 Section "Alternates".

Include in the amount of each Alternate, all labor, materials, overhead and profit, modification of Work specified in the Contract Documents, and additional work that may be required by acceptance of the Alternate.

ALTERNATE NO. 04 – Courtyard Exterior Lighting:

ADD to the Base Bid the sum of:

_____ ($_____)

(words) (figures)

OR

DEDUCT from the Base Bid the sum of:

_____ ($_____)

(words) (figures)

LIST OF ADDENDA RECEIVED

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

BID ATTACHMENTS

Enclosed with this Bid are the following attachments:

Attachment #1 - Non-Collusive Bidding Certification.
Attachment #2 - Certified Corporate Resolution.
Attachment #3 – Iranian Energy Divestment Certification
Attachment #4 – Certification on Violations
Attachment #5 – Bidder's Statement on Sexual Harassment

BID SECURITY

Enclosed with this Bid is bid security in the amount of five percent of the Base Bid.

PUBLIC WORK CONTRACTOR AND SUBCONTRACTOR REGISTRY

The Bidder hereby certifies that the Bidder and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements. **Bidders are required to attach to this bid form proof of registration as required by Labor Law Section 220-i as a minimum qualification and failure to provide proof of registration will disqualify a bidder.**

EXECUTION OF CONTRACT

If written notice of the acceptance of this Bid is transmitted to the undersigned within 45 days following the Bid opening, the undersigned will, within 10 days following the Notice of Award, execute and transmit a Contract in the form as required by the Architect.

This Bid may be withdrawn at any time prior to the Bid opening.

SIGNATURE

( ) NAME OF BIDDER (Corporate Name)
( )
( ) _____
(Corporate Seal)
( ) SIGNATURE (Corporate Officer)
( )
( ) _____
( )
( ) DATE: _____

BID FORM
ATTACHMENT #1

GENERAL CONDITIONS TO BID
NON-COLLUSIVE BIDDING CERTIFICATION

No bid will be accepted that does not have this form completely executed.

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

(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 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;

(d) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as to the person signing in its behalf;

(e) That attached hereto (if corporate bidder) is a certified copy of resolution authorizing the execution of this certified by the signature of this bid or proposal in behalf of the corporate bidder.

_____
(Individual)

_____
(Corporation)

Dated:_____ By _____
(Signature of Officer)

This Non-Collusive Bidding Certificate must be submitted with the bid.

BID FORM
ATTACHMENT #2

CERTIFIED CORPORATE RESOLUTION

RESOLVED THAT _____ be authorized to sign and submit the bid or proposal of this corporation for the following project:

_____

_____

and to include in such bid or proposal the certificate as to non-collusion required by section one hundred three-d (103-d) of the general municipal law as to the act and deed of such corporation, and for any inaccuracies or mis-statements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution and adopted by

_____ at a meeting of its board of directors held on the

_____ day of _____ 20__ .

_____
(Secretary)

BID FORM
ATTACHMENT #3

IRANIAN ENERGY DIVESTMENT CERTIFICATION

Pursuant to Section 103-g
Of the New York State
General Municipal Law

A. By submission of this bid/proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the New York State Finance Law.

B. A Bid/Proposal shall not be considered for award, nor shall any award be made where the condition set forth in Paragraph A above has not been complied with; provided, however, that in any case the bidder/proposer cannot make the foregoing certification set forth in Paragraph A above, the bidder/proposer shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where Paragraph A above cannot be complied with, the Purchasing Unit to the political subdivision, public department, agency or official thereof to which the bid/proposal is made, or his designee, may award a bid/proposal, on a case by case business under the following circumstances:

1. The investment activities in Iran were made before April 12, 2012, the investment activities in Iran have not been expanded or renewed after April 12, 2012, and the Bidder/Proposer has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or

2. The political subdivision makes a determination that the goods or services are necessary for the political subdivision to perform its functions and that, absent such an exemption, the political subdivision would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

_____
Signature

_____
Title

_____ _____
Date Company

BID FORM
ATTACHMENT #4

CERTIFICATION ON VIOLATIONS

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

   ☐ True ☐ False

   If False is selected, information for questions 2 and 3 must be provided. If True is selected questions 2 and 3 are not applicable, continue to question 4.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

   _____

   _____

   _____

   _____

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

   _____

   _____

   _____

   _____

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

_____ _____
Name Title

Sworn to before me this _____day of _____, 20__.

_____
Notary Public

BID FORM
ATTACHMENT #5

BIDDER'S STATEMENT ON SEXUAL HARASSMENT

IN ACCORDANCE WITH NEW YORK STATE FINANCE LAW §139-l

In accordance with State Finance Law §139-l, which generally prohibits the District from entering into contracts pursuant to the bid process with persons who fail to submit a certification affirming compliance with New York Labor Law §201-g, the Bidder submits the following certification under the penalty of perjury:

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

Dated: _____, 20_____

_____
Name of Bidder

_____
Signature of Authorized Official

_____
Printed or Typed Name of Official and Title

Sworn to before me this

_____ day of _____,

_____
Notary Public

NAME OF BIDDER_____

PROPOSED PRODUCTS FORM

SUBMITTED BY THREE LOW BIDDERS WITHIN THREE DAYS FOLLOWING BID OPENING

In accordance with Articles 4 and 6 of the Instructions to Bidders, list specified products and corresponding proposed equivalent products below. Include additional pages as necessary.

Attach additional sheet explaining any aspect of the Contract Documents that cannot be complied with by the manufacturer or supplier of the proposed equivalent product.

Specified Product	**Equivalent Product**
Technical Section: _____	Manufacturer: _____
Specified Product: _____	Product Designation: _____
Technical Section: _____	Manufacturer: _____
Specified Product: _____	Product Designation: _____
Technical Section: _____	Manufacturer: _____
Specified Product: _____	Product Designation: _____
Technical Section: _____	Manufacturer: _____
Specified Product: _____	Product Designation: _____
Technical Section: _____	Manufacturer: _____
Specified Product: _____	Product Designation: _____
Technical Section: _____	Manufacturer: _____
Specified Product: _____	Product Designation: _____
Technical Section: _____	Manufacturer: _____
Specified Product: _____	Product Designation: _____

NAME OF BIDDER_____

PROPOSED SUBCONTRACTORS FORM

SUBMITTED BY THREE LOW BIDDERS
WITHIN THREE DAYS FOLLOWING BID OPENING

Review of proposed subcontractors shall be in accordance with Article 5.2 of the General Conditions.

Instructions:

1. List below name of each subcontractor whose figures have been used in preparing the Bid, and to whom a subcontract is expected to be awarded, upon Architect's review, should the Contract be awarded to the Bidder.

2. For each subcontractor, identify the Specification section(s) included in that subcontract.

Subcontractor Name	**Specification Section**

NAME OF BIDDER_____

BIDDER'S QUALIFICATIONS FORM

NOTARIZED AND SUBMITTED BY THREE LOW BIDDERS
WITHIN THREE DAYS FOLLOWING BID OPENING
UPON REQUEST BY ARCHITECT

All questions must be answered and the data given must be clear and comprehensive. If necessary, questions may be answered on separate attached sheet.

1. Name of Bidder:
2. Permanent main office address:
3. When organized:
4. If a corporation, where incorporated:
5. How many years have you been engaged in the contracting business under your present firm or trade name?
6. Contracts on hand: (List these, showing amount of each contract and the appropriate anticipated dates of completion.)
7. General character of work performed by your company:
8. Have you ever failed to complete any work awarded to you?

   If so, where and why?
9. Have you ever defaulted on a contract?

   If so, where and why?
10. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year completed.
11. List your major equipment available for this Contract.
12. List your experience in work similar to this project.
13. List the background and experience of the principal members of your organization, including officers.
14. List the work to be performed by Subcontractors and summarize the dollar value of each Subcontract.
15. Credit available: $
16. Give bank reference:

17. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner?

18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Bidder's Qualifications Form.

Dated _____this _____ date of _____, 20__ .

_____
(Name of Bidder)

By _____

Title _____

State of _____)
) ss.

County of _____

_____ being duly sworn deposes and says that he is _____

_____ of _____

_____
(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me

this _____ day of_____, 20___

My commission expires _____, 20___

AIA® Document A232® – 2019

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

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

Waverly Central School District
Reconstruction to Elm Street Elementary School Phase 2
145 Elm Street
Waverly, New York 14892
Tetra Tech Project Number: 339070-25002

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

LeChase Construction Services, LLC
11849 East Corning Road Suite 102
Corning, New York 14830

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

Waverly Central School District
15 Fredrick Street
Waverly, New York 14892

THE ARCHITECT:

(Name, legal status, and address)

Tetra Tech Engineers, Architects & Landscape Architects, P.C.
d/b/a Tetra Tech Architects & Engineers
Cornell Business & Technology Park
10 Brown Road
Ithaca, New York 14850

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

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

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

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User Notes: (6ad2455a97732c7ff426e7f6)

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 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.

§ 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 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.

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User Notes: (6ad2455a97732c7ff426e7f6)

§ 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.

§ 1.3 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.

§ 1.2.3.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

.1 Modifications, as defined in Section 1.1.1.
.2 The Agreement.
.3 Addenda, with those of later date having precedence over those of earlier date.
.4 The General Conditions of the Contract for Construction.
.5 Division 01 of the Specifications.
.6 Drawings and remaining Divisions of the Specifications.

In the case of conflicts or discrepancies between Drawings and Divisions of the Specifications (other than Division 01), or within or among the Contract Documents and not clarified by Addendum, the Architect will determine which takes precedence in accordance with Sections 4.2.11, 4.2.12, and 4.2.13.

§ 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.

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§ 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, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

§ 1.9 Submittal Exchange

Submittal Exchange, a web-based construction phase software for managing project submittals, RFI's, and other construction phase paperwork, shall be used by all parties on this project. The Architect will be the administrator for the Submittal Exchange system on this project.

§ 1.9.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect and/or Construction Manager for services required by the Contractor's failure to properly use Submittal Exchange in the submission and processing of construction phase paperwork.

ARTICLE 2 OWNER

§ 2.1 General

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

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work, and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's

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obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

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

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

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

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

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

§ 2.3.7 The Owner shall furnish the Contractor <**Insert number**> copies of the Contract Documents, including one set to be used for the Project Record Drawings. The Contractor may purchase additional copies at the cost of reproduction, postage and handling.

§ 2.3.8 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or 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.

§ 2.5 Owner's Right to Carry Out the Work

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

§ 2.5.1 Where the Contractor's default and/or neglect to carry out its Work in accordance with the Contract Documents threatens the health, safety and/or welfare of the occupants of the Owner's facilities and/or threatens the structural integrity and/or preservation of the Owner's facilities, the Owner may proceed to carry out the Contractor's Work upon twenty-four (24) hours' written notice of its intention to do so to the Contractor. In such case an appropriate Change Order or Construction Change Directive shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies and defaults, including the Owner's expenses and compensation for the Architect's and its respective consultants' additional services and other expenses made necessary by such default, neglect or failure.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.2.1 Do not scale Drawings. Follow figure dimensions, confirming on site.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, 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.

§ 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested 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

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

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

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

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2.1 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 General Requirements (Division 01 of the 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.

§ 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.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract

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Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.1 The Owner is exempt from payment of Federal, State, local taxes, and from payment of sales and compensating use taxes of the State of New York and of cities and counties on all materials and supplies sold to the Owner pursuant to the provisions of this Contract. These taxes are not to be included in bids. This exemption does not, however, apply to tools, machinery, equipment, or other property leased by, or to the Contractor or a subcontractor; and the Contractor and its subcontractor shall be responsible for, and pay, any and all applicable taxes, including sales and compensating use taxes, on such leased tools, machinery, equipment or other property.

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

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.1.1 The Owner shall secure the building permit from the New York State Education Department.

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

§ 3.7.2.1 In accordance New York State Labor Law Article 8, Section 220, subd. 3-a(a), the Contractor shall submit to the Owner within 30 days after issuance of Contractor's first payroll, and every 30 days thereafter, a transcript of the original payroll record, subscribed and affirmed as true under the penalties of perjury. In addition, all contractors and subcontractors working on projects covered by Article 8 of NYS Labor Law also must electronically provide certified payroll records to the New York State Department of Labor ("DOL") through the DOL Certified Payroll portal. Payroll information and records must be provided in the format, manner and frequency required by the DOL. The Contractor shall ensure that its subcontractors comply with these requirements and shall provide the Owner, on request, proof of electronic submission by the Contractor and all subcontractors.

§ 3.7.2.2 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.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

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§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents:

.1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Lump Sum Allowances, Unit Cost Allowances and Quantity Allowances: Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 Contingency Allowances: Contractor's costs, including all such subcontractor costs, for receiving and handling at Project site, labor, installation, and similar costs related to products and materials under allowance shall be included as part of the allowance. Contractor, Overhead and profit related to the allowance shall be included as part of the Contract Sum and not part of the allowance however subcontractor overhead and profit shall be part of allowance. Refer to Section 7.1.4 for maximum combined Contractor and subcontractor overhead and profit percentage;

.4 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2; and

.5 The Architect shall create and process Allowance Access Authorizations for the Construction Manager and Owner's approval and execution in accordance with the Contract Documents.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

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§ 3.8.4 Refer to Division 01 Section "Allowances" for additional information.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect in writing, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and 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, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 3.10.2 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.

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data, and Samples

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

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§ 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, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

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

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

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

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

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

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

§ 3.12.11 The Contractor is required to provide all submittals for the Architect's review; all submittals to be provided to the Architect by the Submittal deadlines noted in the Contract Documents. The Architect's review of Contractor's submittals will be limited to the time preceding the Submittal deadline and will consist of an examination of an initial submittal and **<insert number>** resubmittal[s]. The Owner is entitled to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of additional resubmittals, and for evaluation of submittals for which the initial submission is received after the Submittal deadlines.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

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

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

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§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

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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. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of 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. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for the amounts paid to the Architect for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

§ 4.2.2.2 The Owner is entitled to reimbursement from the Contractor for the amounts paid to the Construction Manager for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

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

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

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform

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the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

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

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

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents and will notify each other about the rejection. The Construction Manager shall determine in general whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require 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, material and equipment 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 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.

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

§ 4.2.13 The Architect will prepare Change Orders, Construction Change Directives and Allowance Change Authorizations.

§ 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 duties, responsibilities and limitations of authority of the Project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

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

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§ 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 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 or the bidding requirements, as soon as practicable after award of the Contract, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design for each principal portion of the Work. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 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 The Contractor shall perform at least **<Insert percentage>** percent of the cost of the Contract (not including the costs of materials, insurance, bonds, submittals and similar items) with its own employees.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the

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Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. 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. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

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

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§ 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.

§ 7.1.4 The combined overhead and profit (for Contractor, subcontractors, suppliers, and contractors of a lower-tier) included in the total cost to the Owner for a change in the Work shall be as follows:

.1 Maximum combined overhead and profit, **<Insert number>** percent of the cost.

.2 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.4.

.3 To facilitate checking of quotations for extras or credits, all proposals shall be accompanied by a complete itemization of costs including labor, materials, rental costs, and Subcontracts. Subcontracts shall be itemized also.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Architect and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;

.2 The amount of the adjustment, if any, in the Contract Sum; and

.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

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

§ 7.3.5 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

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.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Overhead and profit mark-up shall include, but not be limited to, the following:
.1 home office expense;
.2 field office expense;
.3 supervision;
.4 project management & estimation; and
.5 small tools & equipment.

§ 7.3.6 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.7 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.

§ 7.3.8 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.9 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.

§ 7.3.10 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.

§ 7.3.11 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 Architect shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and

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supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. 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. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G7032, Application and Certificate for Payment. Alternative payment application forms are not permitted. AIA Document G732 shall be supported by a current authorized edition of AIA Document G703, Continuation Sheet.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Until Substantial Completion, the Owner shall pay 95 percent of the amount due the Contractor on account of progress payments. At Substantial Completion, the Construction Manager and Architect may authorize remaining partial payments to be made in full, less twice the value of items remaining to be completed and an amount necessary to satisfy any outstanding claims, liens, or judgments.

§ 9.3.1.4 "Applications for Payment must be accompanied by any and all releases of liens for previous applications from Contractor and his/her subcontractors and a sworn and notarized statement that all subcontractors have been paid to at least 95% of previously requisitioned sums.

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

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

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§ 9.4 Certificates for Payment

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

§ 9.4.2 The Construction Manager's certification of an Application 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.

§ 9.4.3 The Architect's issuance of a 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.

§ 9.4.4 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.

§ 9.4.5 The issuance of a 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 9.4.2 and 9.4.3 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. 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;

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.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.

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

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

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

§ 9.6 Progress Payments

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

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

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers' amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors 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 material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

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

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein

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shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

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

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the 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.

§ 9.8.2 No later than 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 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. Absence 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.

§ 9.8.2.1 The Architect will perform no more than one inspection to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

§ 9.8.3 When the Work or designated portion thereof is substantially complete, the Architect will prepare 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.

§ 9.8.4 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

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payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work. Warranties for all equipment, materials, and systems on the Project are to start no sooner than the date of substantial completion. Contractor shall provide extended warranties for all equipment, materials, and systems that may have been turned over to the Owner for partial use or occupancy. 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 On or within seven (7) days following the date of Final Completion (as established in the bid documents or modified by Change Order) the Architect will conduct a final inspection of the work. As a result of that inspection, the Architect will issue a Final Inspection Report. This report will document the condition of the work and will render a formal opinion as to the whether or not the work or designated portion is complete. If, as a result of the Architect's inspection, it is determined that the work is not complete and in accordance with the Contract Documents, the Architect shall notify the Owner and Contractor in writing of this opinion. This notice will include the Final Inspection Report documenting the conditions of the work and will be considered a formal notice to the Contractor of their failure to fulfill the terms and conditions of their contract.

If as a result of this inspection, it is determined that the work is complete, the Contractor shall submit their Final Payment Application and Certificate for Payment. The Architect will then certify and issue the final Certificate for Payment stating that to the best of the Architects knowledge, information and belief, and on the basis of the Architect's periodic site visits and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for payment will constitute a further representation that the conditions listed in section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. The final Certificate for Payment will not be issued until all work on the final inspection report is completed or corrected.

§ 9.10.1.1 The Architect will perform no more than one on-site observation to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional on-site observations.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is

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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) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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

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

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

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

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

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 Contractor shall be responsible for maintaining safety data sheets at the site.

The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take 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;

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.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;

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

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

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

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

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

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

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written 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.

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§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately, and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

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

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

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, and the Architect and Architect's consultants, shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents. The policy certificate must include the project name.

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§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform both the Contractor and the Construction Manager, separately and in writing, prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their

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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 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.

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§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within two years after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the two-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The two-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-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 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 two-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be

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reduced as appropriate and equitable. Such adjustment shall be affected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

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§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.6 Time Limits on Claims

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, but in any case, not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

§ 13.7 Equal Opportunity

§ 13.7.1 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 race, religion, color, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, or natural origin. 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, notice setting forth the policies of non-discrimination.

.2 The Contractor and the Contractor's subcontractors shall, in all solicitations or advertisement for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

§ 13.8 Wage Rates

§ 13.8.1 The Contractor shall comply with Prevailing Wage Rates issued and periodically updated, by the New York State Department of Labor, for the location and duration of the Project.

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, under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

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.3 Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, under direct or indirect contract with the Contractor, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker

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after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section

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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 Written notice shall contain a heading stating "Notice of Claim" to clearly identify it as such. Such notice shall set forth in detail the circumstances that form the basis for the Claim and shall include the following:

.1 Clear statement of claim matter, including background and chronology.
.2 Documentation in support of claim matter.
.3 Documentation in support of claimed damages.
.4 Certification by responsible officer of claimant.

§ 15.1.3.3 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 an 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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 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, written notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

§ 15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

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.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.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date of final payment is due. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

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§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days of receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to the possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

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Reconstruction to Elm Street Elementary School Phase 2
145 Elm Street
Waverly, New York 14892
Tetra Tech Project Number: 339070-25002

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Ithaca, New York 14850

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

§ 1.1.5 Contractors. Contractors are persons or entities~~, other than the Contractor or Separate Contractors,~~ who perform

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Work under contracts with the Owner that are administered by the Architect and Construction Manager.

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§ 1.2.3.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

.1 Modifications, as defined in Section 1.1.1.

.2 The Agreement.

.3Addenda, with those of later date having precedence over those of earlier date.

.4 The General Conditions of the Contract for Construction.

.5 Division 01 of the Specifications.

.6 Drawings and remaining Divisions of the Specifications.

In the case of conflicts or discrepancies between Drawings and Divisions of the Specifications (other than Division 01), or within or among the Contract Documents and not clarified by Addendum, the Architect will determine which takes precedence in accordance with Sections 4.2.11, 4.2.12, and 4.2.13.

PAGE 5:

The parties shall agree upon ~~written~~ protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

Any use of, or reliance on, all or a portion of a building information model without agreement to ~~written~~ protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

§ 1.9 Submittal Exchange

Submittal Exchange, a web-based construction phase software for managing project submittals, RFI's, and other construction phase paperwork, shall be used by all parties on this project. The Architect will be the administrator for the Submittal Exchange system on this project.

§ 1.9.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect and/or Construction Manager for services required by the Contractor's failure to properly use Submittal Exchange in the submission and processing of construction phase paperwork.

PAGE 6:

§ 2.3.7 ~~Unless otherwise provided in~~The Owner shall furnish the Contractor <Insert number> copies of 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~~including one set to be used for the Project Record Drawings. The Contractor may purchase additional copies at the cost of reproduction, postage and handling.

§ 2.3.8 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager. ~~Other communication~~ and shall ~~be made as set forth in Section 4.2.6~~contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents.

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

§ 2.5.1 Where the Contractor's default and/or neglect to carry out its Work in accordance with the Contract Documents threatens the health, safety and/or welfare of the occupants of the Owner's facilities and/or threatens the structural integrity and/or preservation of the Owner's facilities, the Owner may proceed to carry out the Contractor's Work upon twenty-four (24) hours' written notice of its intention to do so to the Contractor. In such case an appropriate Change Order or Construction Change Directive shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies and defaults, including the Owner's expenses and compensation for the Architect's and its respective consultants' additional services and other expenses made necessary by such default, neglect or failure.

PAGE 8:

§ 3.2.2.1 Do not scale Drawings. Follow figure dimensions, confirming on site.

§ 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested 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.

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§ 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 General Requirements (Division 01 of the 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.

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§ 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.

§ 3.6.1 The Owner is exempt from payment of Federal, State, local taxes, and from payment of sales and compensating use taxes of the State of New York and of cities and counties on all materials and supplies sold to the Owner pursuant to the provisions of this Contract. These taxes are not to be included in bids. This exemption does not, however, apply to tools, machinery, equipment, or other property leased by, or to the Contractor or a subcontractor; and the Contractor and its subcontractor shall be responsible for, and pay, any and all applicable taxes, including sales and compensating use taxes, on such leased tools, machinery, equipment or other property.

PAGE 10:

§ 3.7.1.1 The Owner shall secure the building permit from the New York State Education Department.

§ 3.7.2.1 In accordance New York State Labor Law Article 8, Section 220, subd. 3-a(a), the Contractor shall submit to the Owner within 30 days after issuance of Contractor's first payroll, and every 30 days thereafter, a transcript of the original payroll record, subscribed and affirmed as true under the penalties of perjury. In addition, all contractors and subcontractors working on projects covered by Article 8 of NYS Labor Law also must electronically provide certified payroll records to the New York State Department of Labor ("DOL") through the DOL Certified Payroll portal. Payroll information and records must be provided in the format, manner and frequency required by the DOL. The Contractor shall ensure that its subcontractors comply with these requirements and shall provide the Owner, on request, proof of electronic submission by the Contractor and all subcontractors.

§ 3.7.2.2 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.

PAGE 11:

.1~~allowances~~Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

~~§ 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~~be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

.2Lump Sum Allowances, Unit Cost Allowances and Quantity Allowances: Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3~~whenever~~Contingency Allowances: Contractor's costs, including all such subcontractor costs, for receiving and handling at Project site, labor, installation, and similar costs related to products and materials under allowance shall be included as part of the allowance. Contractor, Overhead and profit related to the allowance shall be included as part of the Contract

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Sum and not part of the allowance however subcontractor overhead and profit shall be part of allowance. Refer to Section 7.1.4 for maximum combined Contractor and subcontractor overhead and profit percentage;

.4Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2; and

.5The Architect shall create and process Allowance Access Authorizations for the Construction Manager and Owner's approval and execution in accordance with the Contract Documents.

§ 3.8.4 Refer to Division 01 Section "Allowances" for additional information.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect in writing, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and 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.~~

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§ 3.10.~~3~~2 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~~3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.12.5 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.

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§ 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 in writing of such deviation at the time of submittal and (1) the Architect has given written approval

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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.

§ 3.12.11 The Contractor is required to provide all submittals for the Architect's review; all submittals to be provided to the Architect by the Submittal deadlines noted in the Contract Documents. The Architect's review of Contractor's submittals will be limited to the time preceding the Submittal deadline and will consist of an examination of an initial submittal and <insert number> resubmittal[s]. The Owner is entitled to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of additional resubmittals, and for evaluation of submittals for which the initial submission is received after the Submittal deadlines.

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

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§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. 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. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for the amounts paid to the Architect for site visits

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made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

§ 4.2.2.2 The Owner is entitled to reimbursement from the Contractor for the amounts paid to the Construction Manager for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

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§ 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.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents~~,~~ and will notify each other about the rejection. The Construction Manager shall determine in general whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require 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, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

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§ 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.

§ 4.2.13 The ~~Construction Manager~~Architect will prepare Change Orders, ~~and~~ Construction Change Directives and Allowance Change Authorizations.

§ 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.

§ 4.2.17 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 duties, responsibilities and limitations of authority of the Project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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§ 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.

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

§ 5.2.5 The Contractor shall perform at least <Insert percentage> percent of the cost of the Contract (not including the costs of materials, insurance, bonds, submittals and similar items) with its own employees.

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§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. 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. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When ~~the Owner performs~~separate contracts are awarded for different portions of the Project or other construction or operations ~~with~~on the ~~Owner's own forces or Separate Contractors, the~~site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of ~~such~~the activities of the Owner's own forces and of each Separate ~~Contractors~~Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

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§ 6.1.3~~4~~ 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.

§ 6.2.1 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.

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§ 7.1.4 The combined overhead and profit (for Contractor, subcontractors, suppliers, and contractors of a lower-tier) included in the total cost to the Owner for a change in the Work shall be as follows:

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.1 Maximum combined overhead and profit, <Insert number> percent of the cost.

.2 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.4.

.3 To facilitate checking of quotations for extras or credits, all proposals shall be accompanied by a complete itemization of costs including labor, materials, rental costs, and Subcontracts. Subcontracts shall be itemized also.

A Change Order is a written instrument prepared by the ~~Construction Manager~~Architect and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

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

§ 7.3.5 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

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.4~~Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and~~Overhead and profit mark-up shall include, but not be limited to, the following:

.5 ~~Costs of supervision and~~ 1 home office expense;

.2field office ~~personnel directly attributable to the change~~.expense;

.3 supervision;

.4 project management & estimation; and

.5 small tools & equipment.

§ 7.3.5~~6~~ If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6~~7~~ Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7~~8~~ A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

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§ 7.3.89 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.

§ 7.3.910 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.

§ 7.3.1011 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 ManagerArchitect shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

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§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. 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. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G7032, Application and Certificate for Payment. Alternative payment application forms are not permitted. AIA Document G732 shall be supported by a current authorized edition of AIA Document G703, Continuation Sheet.

§ 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. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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§ 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.

§ 9.3.1.3 Until Substantial Completion, the Owner shall pay 95 percent of the amount due the Contractor on account of progress payments. At Substantial Completion, the Construction Manager and Architect may authorize remaining partial payments to be made in full, less twice the value of items remaining to be completed and an amount necessary to satisfy any outstanding claims, liens, or judgments.

§ 9.3.1.4 "Applications for Payment must be accompanied by any and all releases of liens for previous applications from Contractor and his/her subcontractors and a sworn and notarized statement that all subcontractors have been paid to at least 95% of previously requisitioned sums.

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

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

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

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

§ 9.4.4~~3~~ 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~~4~~ 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~~5~~ 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.

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§ 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 9.4.32 and 9.4.43 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

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliersmaterial and equipment suppliers' amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors 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 material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

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If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager,No later than 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 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. IfAbsence the Architect's inspection discloses any item, whether or not included on the list,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

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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~~ to determine the actual date of Substantial Completion.

§ 9.8.~~4 When the~~2.1 The Architect~~, assisted by the Construction Manager, determines that the Work of all of the Contractors, or~~ will perform no more than one inspection to determine whether the Work or a designated portion thereof~~, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute,~~has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

§ 9.8.3 When the Work or designated portion thereof is substantially complete, the Architect will prepare 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.

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If as a result of this inspection, it is determined that the work is complete, the Contractor shall submit their Final Payment Application and Certificate for Payment. The Architect will then certify and issue the final Certificate for Payment stating that to the best of the Architects knowledge, information and belief, and on the basis of the Architect's periodic site visits and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for payment will constitute a further representation that the conditions listed in section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. The final Certificate for Payment will not be issued until all work on the final inspection report is completed or corrected.

§ 9.8.5~~4~~ The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9.1 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.~~ Warranties for all equipment, materials, and systems on the Project are to start no sooner than the date of substantial completion. Contractor shall provide extended warranties for all equipment, materials, and systems that may have been turned over to the Owner for partial use or occupancy. 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.

§ 9.10.1 ~~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~~

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~~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~~On or within seven (7) days following the date of Final Completion (as established in the bid documents or modified by Change Order) the Architect will conduct a final inspection of the work. As a result of that inspection, the Architect will issue a Final Inspection Report. This report will document the condition of the work and will render a formal opinion as to the whether or not the work or designated portion is complete. If, as a result of the Architect's inspection, it is determined that the work is not complete and in accordance with the Contract Documents, the Architect shall notify the Owner and Contractor in writing of this opinion. This notice will include the Final Inspection Report documenting the conditions of the work and will be considered a formal notice to the Contractor of their failure to fulfill the terms and conditions of their contract.

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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 Contractor shall be responsible for maintaining safety data sheets at the site.

§ 9.10.1.1 The Architect will perform no more than one on-site observation to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional on-site observations.

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

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If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of 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.

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§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, and the Architect and Architect's consultants, shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents. The policy certificate must include the project name.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has

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reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately, and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within ~~one year~~two years after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the ~~one~~two-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The ~~one~~two-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The ~~one~~two-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 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~~two-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.

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be ~~effected~~affected whether or not final payment has been made.

The Contract shall be governed by the law of the place where the Project is located ~~excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4~~.

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§ 13.6 Time Limits on Claims

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, but in any case, not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

§ 13.7 Equal Opportunity

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§ 13.7.1 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 race, religion, color, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, or natural origin. 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, notice setting forth the policies of non-discrimination.

.2 The Contractor and the Contractor's subcontractors shall, in all solicitations or advertisement for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

§ 13.8 Wage Rates

§ 13.8.1 The Contractor shall comply with Prevailing Wage Rates issued and periodically updated, by the New York State Department of Labor, for the location and duration of the Project.

§ 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, under direct or indirect contract with the Contractor, for any of the following reasons:

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, under direct or indirect contract with the Contractor, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

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§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

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§ ~~15.1.3.2~~ 15.1.3.2 Written notice shall contain a heading stating "Notice of Claim" to clearly identify it as such. Such notice shall set forth in detail the circumstances that form the basis for the Claim and shall include the following:

.1 Clear statement of claim matter, including background and chronology.

.2 Documentation in support of claim matter.

.3 Documentation in support of claimed damages.

.4 Certification by responsible officer of claimant.

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§ 15.1.3.3 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 an event, no decision by the Initial Decision Maker is required.

§ 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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

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§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, written 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.

§ 15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

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.~~

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date of final payment is due. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim~~,~~ or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to ~~a~~the 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.

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§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. ~~If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.~~

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~~§ 15.4 Arbitration~~

~~§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.~~

~~§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.~~

~~§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.~~

~~§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.~~

~~§ 15.4.4 Consolidation or Joinder~~

~~§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).~~

~~§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.~~

~~§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.~~

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Corning, New York 14830

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Heather Sorce, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 11:41:18 EDT on 10/16/2026 under Order No. 20250100070 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A232™ - 2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A132® – 2019

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

AGREEMENT was made as of the Thirteenth Day of November in the year Two Thousand Twenty Five.
(In words, indicate day, month, and year.)

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

Waverly Central School District
15 Fredrick Street
Waverly, New York 14892

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

Contract:

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

Waverly Central School District
Reconstruction to Elm Street Elementary School Phase 2
145 Elm Street
Waverly, New York 14892
Tetra Tech Project Number: 339070-25002

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

LeChase Construction Services, LLC
11849 East Corning Road Suite 102
Corning, New York 14830

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

Tetra Tech Engineers, Architects & Landscape Architects, P.C.
d/b/a Tetra Tech Architects & Engineers
Cornell Business & Technology Park

10 Brown Road
Ithaca, New York 14850

The Owner and Contractor agree as follows.

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

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

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

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TABLE OF ARTICLES

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EXHIBIT A INSURANCE AND BONDS

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:
(Check one of the following boxes.)

[ ] The date of this Agreement.

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

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

Refer to Section 01 12 00 – Multiple Contract Summary

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

§ 3.3 Substantial Completion of the Project or Portions Thereof

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

§ 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

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

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

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

[ ] By the following date:

§ 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

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

ARTICLE 4 CONTRACT SUM

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

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

§ 4.2 Stipulated Sum

§ 4.2.1 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

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

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the fifth day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the thirtieth (30th) day of the same month in which Application for Payment is received month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than forth-five (45) days after the Construction Manager receives the Application for Payment.

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

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This

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schedule of values, unless objected by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

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

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

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

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

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

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

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

Five percent (5%)

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

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

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§ 5.2 Final Payment

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

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

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

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

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

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

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

§ 6.2 Binding Dispute Resolution

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

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

[X] Litigation in a court of competent jurisdiction.

[ ] Other: *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

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

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

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§ 7.3 Suspension

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

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

Jeffrey Mastrantuono
Waverly Central School District
45 Lincoln Street
Waverly, New York 14892

Phone: 607-565-2841
Email: jeffmastrantuono@wcsdletsgo.com

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

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

§ 8.5 Insurance and Bonds

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

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

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with a building information modeling exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with a building information modeling exhibit, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

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§ 8.7 Other provisions:

1. Any unused Allowance Costs to be returned to the Owner.
2. PUBLIC WORK CONTRACTOR AND SUBCONTRACTOR REGISTRY: The Contractor hereby certifies that the Contractor and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements.

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 A132™–2019, Exhibit A, Insurance and Bonds Exhibit

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

.4 Drawings

Number	Title	Date
00 01 15	List of Drawings Sheet	February 23, 2026

.5 Specifications

Section	Title	Date	Pages
00 01 10	Table of Contents	February 23, 2026	5

.6 Addenda, if any:

Number	Date	Pages

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

.7 Other

documents, if any, listed below:

The Contract Documents include the Notice To Bidders (Advertisement), Instructions to Bidders, Supplementary Instructions to Bidders, Bid Form (including Unit Prices) (executed by Bidder), the Non-Collusive Bidding Certification (executed by Bidder), General Conditions, Specifications, Drawings, Addenda issued prior to execution of the Contract, Agreement between Owner and Contractor ("Agreement"), other Documents listed in the Agreement, and Modifications issued or negotiated after receipt of bids or execution of the Agreement.

Where the term "Agreement", "Contract" or "Prime Contract" is used in the General Conditions and other Contract Documents, it shall mean the separate Owner-Contractor Agreement between the Owner and each Prime Contractor identified in Conditions of the Contract (General and other conditions).

.8 Pre-Award Questionnaire

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

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

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Additions and Deletions Report for

AIA® Document A132® – 2019

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PAGE 1:

AGREEMENT was made as of the ~~day~~ Thirteenth Day of November in the year Two Thousand Twenty Five.

Waverly Central School District

15 Fredrick Street

Waverly, New York 14892

Contract:

Waverly Central School District

Reconstruction to Elm Street Elementary School Phase 2

145 Elm Street

Waverly, New York 14892

Tetra Tech Project Number: 339070-25002

LeChase Construction Services, LLC
11849 East Corning Road Suite 102
Corning, New York 14830

Tetra Tech Engineers, Architects & Landscape Architects, P.C.

d/b/a Tetra Tech Architects & Engineers
Cornell Business & Technology Park

10 Brown Road

Ithaca, New York 14850

PAGE 2:

~~EXHIBIT B DETERMINATION OF THE COST OF THE WORK~~

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[X] Established as follows:

~~If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.~~Refer to Section 01 12 00 – Multiple Contract Summary

PAGE 3:

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

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

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

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

PAGE 4:

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

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

~~§ 4.3.2 The Contractor's Fee:~~

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

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

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

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

~~§ 4.3.6 Unit prices, if any:~~

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

~~Item~~

~~Units and Limitations~~

~~Price per Unit ($0.00)~~

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

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

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

~~§ 4.4.2 The Contractor's Fee:~~

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

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

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

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

~~§ 4.4.6 Unit Prices, if any:~~

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

~~Item~~

~~Units and Limitations~~

~~Price per Unit ($0.00)~~

~~§ 4.4.7 Guaranteed Maximum Price~~

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

~~§ 4.4.7.2 Alternates~~

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

PAGE 5:

~~Item~~

~~Price~~

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

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

~~Item~~

~~Price~~

~~Conditions for Acceptance~~

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

~~(Identify each allowance.)~~

~~Item~~

~~Price~~

~~§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:~~

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~~(Identify each assumption.)~~

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

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

~~§ 4.5 Liquidated damages, if any:~~

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

~~§ 4.6 Other:~~

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

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the fifth day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the ~~-~~thirtieth (30th) day of the same month in which Application for Payment is received month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than forth-five (~~–~~45) days after the Construction Manager receives the Application for Payment.

~~(Federal, state or local laws may require payment within a certain period of time.)~~

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values, unless objected by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

PAGE 6:

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

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

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

~~§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.~~

~~§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the~~

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~~amount of each progress payment shall be computed as follows:~~

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

~~.1 The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;~~

~~.2That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and~~

~~.3The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.~~

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

~~.1 The aggregate of any amounts previously paid by the Owner;~~

~~.2The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;~~

~~.3Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;~~

~~.4For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;~~

~~.5The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and~~

PAGE 7:

~~.6 Retainage withheld pursuant to Section 5.1.7.~~

~~.4The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.~~

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

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

~~§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for~~

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~~materials or equipment which have not been delivered and stored at the site.~~

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

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

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

~~§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.~~

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

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

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

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

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

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

~~.1That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;~~

~~.2That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;~~

~~.3That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and~~

PAGE 8:

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

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~~.1 The aggregate of any amounts previously paid by the Owner;~~

~~.2The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;~~

~~.3Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;~~

~~.4For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;~~

~~.5The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and~~

~~.6 Retainage withheld pursuant to Section 5.1.7.~~

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

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

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

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

~~§ 5.1.7.1.1 The following items are not subject to retainage:~~

~~(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)~~

Five percent (5%)

PAGE 9:

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

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

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

~~.2the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost~~

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~~of the Work and a final Application for Payment; and~~

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

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

~~§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.~~

~~(Insert rate of interest agreed upon, if any.)~~

~~%~~

[X] Litigation in a court of competent jurisdiction.

PAGE 10:

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

~~(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)~~

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

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

~~§ 7.2.1 Termination~~

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

~~§ 7.2.1.2 Termination by the Owner for Cause~~

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

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

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

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

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

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

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

~~§ 7.2.1.3 Termination by the Owner for Convenience~~

~~If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:~~

~~(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)~~

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

PAGE 11:

Jeffrey Mastrantuono

Waverly Central School District
45 Lincoln Street
Waverly, New York 14892

Phone: 607-565-2841

Email: jeffmastrantuono@wcsdletsgo.com

§ 8.7 ~~Relationship of the Parties~~ Other provisions:

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

~~§ 8.8 Other provisions:~~

PAGE 12:

1. Any unused Allowance Costs to be returned to the Owner.

2.PUBLIC WORK CONTRACTOR AND SUBCONTRACTOR REGISTRY: The Contractor hereby certifies that the Contractor and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements.

.4 ~~Building Information Modeling Exhibit, if completed:~~

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~~.5~~ ~~Drawings~~

00 01 15

List of Drawings Sheet

February 23, 2026

.~~6~~5 Specifications

00 01 10

Table of Contents

February 23, 2026

5

.~~7~~6 Addenda, if any:

.~~8~~7 Other ~~Exhibits:~~

~~(Check all boxes that apply and include appropriate information identifying the exhibit where required.)~~

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

~~[ ]AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:~~

~~(Insert the date of the E235-2019 incorporated into this Agreement.)~~

~~[ ] The Sustainability Plan:~~

~~Title~~

~~Date~~

~~Pages~~

~~[ ] Supplementary and other Conditions of the Contract:~~

~~Document~~

~~Title~~

~~Date~~

~~Pages~~

~~.9 Other documents, if any, listed below:~~

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

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~~Any such documents should be listed here only if intended to be part of the Contract Documents.)~~

documents, if any, listed below:

PAGE 13:

The Contract Documents include the Notice To Bidders (Advertisement), Instructions to Bidders, Supplementary Instructions to Bidders, Bid Form (including Unit Prices) (executed by Bidder), the Non-Collusive Bidding Certification (executed by Bidder), General Conditions, Specifications, Drawings, Addenda issued prior to execution of the Contract, Agreement between Owner and Contractor ("Agreement"), other Documents listed in the Agreement, and Modifications issued or negotiated after receipt of bids or execution of the Agreement.

Where the term "Agreement", "Contract" or "Prime Contract" is used in the General Conditions and other Contract Documents, it shall mean the separate Owner-Contractor Agreement between the Owner and each Prime Contractor identified in Conditions of the Contract (General and other conditions).

.8 Pre-Award Questionnaire

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Heather Sorce, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 11:48:34 EDT on 10/16/2026 under Order No. 20250100070 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A132™ - 2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A132® – 2019 Exhibit A

Insurance and Bonds

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

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

Waverly Central School District
Reconstruction to Elm Street Elementary School Phase 2
145 Elm Street
Waverly, New York 14892
Tetra Tech Project Number: 339070-25002

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

Waverly Central School District
15 Fredrick Street
Waverly, New York 14892

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

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

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

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

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

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

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

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Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

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

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

Causes of Loss	**Sub-Limit**

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

Coverage	**Sub-Limit**

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

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

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the

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continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

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

§ A.2.4 Optional Extended Property Insurance.

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

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

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

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

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

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

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

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

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

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

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

[ ] **§ A.2.5.2 Other Insurance**

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

Coverage	**Limits**

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

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

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

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, CG 20 32 07 04.

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§ A.3.2 Contractor's Required Insurance Coverage

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

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than One Millon Dollars ($ 1,000,000.00) each occurrence, Two Millon Dollars($ 2,000,000.00) general aggregate, and Two Millon Dollars ($ 2,000,000.00) aggregate for products-completed operations hazard, providing coverage for claims including

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

.2 personal injury and advertising injury;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

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§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than Five Hundred Thousand Dollars($ 500,000.00) each accident, Five Hundred Thousand Dollars ($ 500,000.00) each employee, and Five Hundred Thousand Dollars ($ 500,000.00) policy limit.

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

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and One Millon Dollars ($ 1,000,000.00) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and One Millon Dollars ($ 1,000,000.00) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and Two Millon Dollars ($ 2,000,000.00) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and Two Millon Dollars ($ 2,000,000.00) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and One Millon Dollars ($ 1,000,000.00) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

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

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

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

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

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

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

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

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

[ ] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[ ] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	**Limits**
Umbrella Policy	$1,000,000 per Occurrence / $1,000,000 Aggregate
Installation Floater Policy	One Hundred Thousand Dollars ($100,000)

§ A.3.4 Performance Bond and Payment Bond
The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	**Penal Sum ($0.00)**
Payment Bond	
Performance Bond	

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

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ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

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

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Additions and Deletions Report for

AIA® Document A132® – 2019 Exhibit A

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 11:55:23 EDT on 10/16/2026.

PAGE 1:

Waverly Central School District
Reconstruction to Elm Street Elementary School Phase 2
145 Elm Street
Waverly, New York 14892
Tetra Tech Project Number: 339070-25002

-

Waverly Central School District
15 Fredrick Street
Waverly, New York 14892

-

PAGE 4:

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than One Millon Dollars ($ 1,000,000.00) each occurrence, Two Millon Dollars($ 2,000,000.00) general aggregate, and Two Millon Dollars ($ 2,000,000.00) aggregate for products-completed operations hazard, providing coverage for claims including

PAGE 5:

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.6 Employers' Liability with policy limits not less than Five Hundred Thousand Dollars($ 500,000.00) each accident, Five Hundred Thousand Dollars ($ 500,000.00) each employee, and Five Hundred Thousand Dollars ($ 500,000.00) policy limit.

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and One Millon Dollars ($ 1,000,000.00) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and One Millon Dollars ($ 1,000,000.00) in the aggregate.

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PAGE 6:

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and Two Millon Dollars ($ 2,000,000.00) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and Two Millon Dollars ($ 2,000,000.00) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than One Millon Dollars ($ 1,000,000.00) per claim and One Millon Dollars ($ 1,000,000.00) in the aggregate.

PAGE 7:

$1,000,000 per Occurrence / $1,000,000 Aggregate

Umbrella Policy

Installation Floater Policy

One Hundred Thousand Dollars ($100,000)

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Kathy Hochul, Governor

Roberta Reardon, Commissioner

Waverly Central School Distric

Edward Bernhauer
Tetra Tech Architects & Engine
Cornell Business & Technology
10 Brown Road
Ithaca NY 14850

Schedule Year	2026 through 2027
Date Requested	01/26/2026
PRC#	2026001654

Location	Waverly Elementary School
Project ID#	339070-25002
Project Type	Reconstruction to Waverly Elementary School

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Rate Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2026 through June 2027. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Waverly Central School Distric

Edward Bernhauer
Tetra Tech Architects & Engine
Cornell Business & Technology
10 Brown Road
Ithaca NY 14850

Schedule Year 2026 through 2027
Date Requested 01/26/2026
PRC# 2026001654

Location Waverly Elementary School
Project ID# 339070-25002
Project Type Reconstruction to Waverly Elementary School

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information
All information must be supplied

Federal Employer Identification Number: _____

Name: _____

Address: _____

_____

City: _____ State: _____ Zip: _____

Amount of Contract: $_____

Approximate Starting Date: ____/____/____

Approximate Completion Date: ____/____/____

Contract Type:
[ ] (01) General Construction
[ ] (02) Heating/Ventilation
[ ] (03) Electrical
[ ] (04) Plumbing
[ ] (05) Other : _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Contractor Registry

Effective December 30, 2024 all contractors and subcontractors submitting bids or performing construction work on public work projects, or private projects covered by Article 8 of the Labor Law, are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. To register, contractors and subcontractors must submit an application through NYSDOL's Contractor Registry portal which is available through the agency's Management System for Protecting Worker Rights (MPWR) https://mpwr-public.labor.ny.gov/en/login.

For additional information, please visit online.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission: a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing a "Request for Wage and Supplement Information" form (PW 39).The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion online.

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website dol.ny.gov .

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website dol.ny.gov .

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website dol.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment.Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed $100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds $25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of $50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to $1,500 for a first offense and up to $5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, https://dol.ny.gov/public-work-and-prevailing-wage
If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov .

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website *www.labor.ny.gov* or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

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1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

NEW YORK STATE OF OPPORTUNITY. Department of Labor

Required Notice under Article 25-B of the Labor Law

Attention All Employees, Contractors and Subcontractors: You are Covered by the Construction Industry Fair Play Act

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor**, you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

• **Civil Penalty**	First offense: Up to $2,500 per employee Subsequent offense(s): Up to $5,000 per employee
• **Criminal Penalty**	First offense: Misdemeanor - up to 30 days in jail, up to a $25,000 fine and debarment from performing public work for up to one year. Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a $50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)

WE ARE YOUR DOL

NEW YORK STATE Department of Labor

New York State Department of Labor
Bureau of Public Work

Attention Employees

THIS IS A:

PUBLIC WORK PROJECT

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at: https://dol.ny.gov/bureau-public-work

If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is $250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training “prior to the performing any work on the project.”

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.)*
- Training roster, attendance record of other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is $3 million in Bronx, Kings, New York, Queens and, Richmond counties; $1.5 million in Nassau, Suffolk and Westchester counties; and $500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirement s on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.
Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.
Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.
Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

Contractor Registry (LL 220-I)

Labor Law Section 220-i requires that contractors obtain a Contractor Registry certificate of registration prior to bidding on or commencing work on a public or private project subject to prevailing wage requirements. Subcontractors also are prohibited from commencing work on covered employment unless they have received a Contractor Registry certificate. Contractors are required to submit their Certificate of Registration with their bid materials. A public database is available online to confirm registration at data.ny.gov to confirm registration validity. For additional information on how to register and the requirements, visit https://dol.ny.gov/public-work-contractor-and-subcontractorregistry-
landing.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Additionally, as per Article 6 of the Labor Law, contractors and subcontractors are required to establish, maintain, and preserve for not less that six (6) years, contemporaneous, true, and accurate payroll records.

At a minimum, payrolls must show the following information for each person employed on a public work project: Name; Address, Last 4 Digits of Social Security number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

Electronic Certified Payroll (LL 220-J)
Effective December 31, 2025, all contractors and subcontractors who perform public work, or covered private work subject to the prevailing wage, will be required to submit certified payrolls electronically to the Bureau of Public Work and Prevailing Wage Enforcement. Additional information about the electronic certified payroll submission system will be made available on the Department's Website at https://dol.ny.gov/Electronic-Payroll

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. The specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. Please Note: Updates to the Wage Schedule shall be made on a quarterly basis.

All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Shift Work

If the timeline of the contract requires shift work be performed to meet deadlines, the BPWE will enforce the shift work rate as the required rate on the project whether or not shift work is specifically addressed in the contract.

Paid Prenatal Leave

Every employer shall be required to provide to its employees twenty hours of paid prenatal personal leave during any fifty-two week calendar period. Paid prenatal personal leave shall mean leave taken for the health care services received by an employee during their pregnancy or related to such pregnancy, including physical examinations, medical procedures, monitoring and testing, and discussions with a healthcare provider related to the pregnancy. Paid prenatal personal leave may be taken in hourly increments. Benefits for paid prenatal personal leave shall be paid in hourly installments. Employees shall receive compensation at the employee's regular rate of pay, or the applicable minimum wage established by the labor law, whichever is greater, for the use of Paid Prenatal leave.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12226

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Tioga County General Construction

Boilermaker — 10/01/2026

JOB DESCRIPTION Boilermaker **DISTRICT** 1

ENTIRE COUNTIES
Albany, Broome, Chenango, Columbia, Delaware, Essex, Fulton, Greene, Hamilton, Herkimer, Montgomery, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Tioga, Warren, Washington

WAGES
Per hour

	07/01/2026	01/01/2027 Additional
Boilermaker	$ 45.84	$ 2.50*

*To be allocated at a later date

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker	$ 26.51 + $1.49*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 25) on HOLIDAY PAGE
Note: When a holiday falls on Sunday, the day observed by the State or Nation shall be observed, and when Christmas Day and New Year's fall on Saturday, Friday will be observed as the holiday.

REGISTERED APPRENTICES
(1/2) year terms at the following percentage of Journeyworker's wage per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th
65%	65%	70%	75%	80%	85%	90%	95%

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 19.71 +1.49*	$ 19.71 +1.49*	$ 20.69 +1.49*	$ 21.64 +1.49*	$ 22.62 +1.49*	$ 23.60 +1.49*	$ 24.57 +1.49*	$ 25.53 +1.49*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

1-197

Broadband — 10/01/2026

JOB DESCRIPTION Broadband **DISTRICT** 4

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

PARTIAL COUNTIES
Orange: Only in the Village of Greenwood Lake, Village of Highland Falls, Town of Tuxedo, and Town of Patterson

WAGES
NOTE: Applies to all public work and covered private projects, including those receiving ConnectAll funding subject to New York State Labor Law §224-E, solicited on or after July 1,2025. For all other projects solicited prior to July 1,2025 please see LINEMAN ELECTRICIAN(1)-TELEDATA

Per Hour:	07/01/2026	08/04/2026
Field Tech Install/Repair*	$ 52.85	$ 54.44

For outside work (excluding installation on building construction/alteration/renovation projects), stopping at first point of attachment (demarcation), installing/maintaining/repairing broadband internet service.

"Broadband", "Broadband Service", or "Broadband Internet" means mass-market retail service by wire or radio that provides the capability to transmit data to and receive data from all or substantially all internet endpoints, including any capabilities that are incidental to and enable the operation of the communications service, but excluding dial-up internet access service.

*NOTE: EXCLUDES work within ten(10) feet of High Voltage (600 Volts and over) transmission lines. Please see LINEMAN rates.
*NOTE: Does not include the operation of equipment. Please see applicable OPERATING ENGINEER rates.
*NOTE: Does not include Groundmen/Flagger/Flagmen. Please see LABORER/LABORER-HEAVY/HIGHWAY rates.

SUPPLEMENTAL BENEFITS
Per Hour:

$ 23.24

OVERTIME PAY
See (B, K, *R) on OVERTIME PAGE
* Two and one half times the hourly rate after the 8th hour

HOLIDAY
Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

4-CWA-Dist2

Carpenter - Building 10/01/2026

JOB DESCRIPTION Carpenter - Building **DISTRICT** 2

ENTIRE COUNTIES
Broome, Tioga

WAGES

Per hour:	07/01/2026	07/01/2027 Additional	07/01/2028 Additional
Carpenter	$ 35.19	$ 4.00*	$ 3.00*
Floor Coverer	35.19	4.00*	3.00*
Carpet Layer	35.19	4.00*	3.00*
Dry-Wall	35.19	4.00*	3.00*
Diver-Wet Day	60.19	4.00*	3.00*
Diver -Dry Day	36.19	4.00*	3.00*
Diver Tender	36.19	4.00*	3.00*

*To be allocated at a later date

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (per hour worked):
- Pile Drivers/Dock Builders shall receive $0.25 per hour over the journeyworker's rate of pay when performing piledriving/dock building work.
- Certified welders shall receive $3.00 per hour over the journeyworker's rate of pay when the employee is required to be certified and performs DOT, AWS, or ABS specified welding work.
- When an employee performs work within a contaminated area on a State and/or Federally designated hazardous waste site, and where relevant State and/or Federal regulations require employees to be furnished and use or wear required forms of personal protection, then the employee shall receive their regular hourly rate plus $1.50 per hour.
- Depth pay for Divers based upon deepest depth on the day of the dive (per diem payment):
  0' to 80' no additional fee
  81'to 100' additional $.50 per foot
  101'to 150' additional $0.75 per foot
  151'and deeper additional $1.25 per foot
- Penetration pay for Divers based upon deepest penetration on the day of the dive (per diem payment):
  0' to 50' no additional fee
  51' to 100' additional $.75 per foot
  101' and deeper additional $1.00 per foot
- Diver rates applies to all hours worked on dive day.

SHIFT WORK
On Agency/Owner mandated shift work, the following rates will be applicable:
1st Shift - Regular Rate
2nd Shift - Premium of 10% of base wage per hour
3rd Shift - Premium of 15% of base wage per hour
Shift work shall be defined as implementing at least two (2) shifts in a twenty-four (24) consecutive hour period. Shift work must be for a minimum of three (3) consecutive days.

SUPPLEMENTAL BENEFITS
Per hour:

	07/01/2026
Journeyworker	$ 22.57

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: Any holiday which occurs on Sunday shall be observed the following Monday. If Christmas falls on a Saturday, it shall be observed on the prior Friday.

REGISTERED APPRENTICES
Wages per hour (1300 hour terms at the following percentage of Journeyworker's base wage):

1st	2nd	3rd	4th
65%	70%	75%	80%

Supplemental Benefits per hour:

$ 13.05	$ 13.05	$ 15.65	$ 15.65

NOTE ADDITIONAL AMOUNTS PAID TO APPRENTICES FOR THE FOLLOWING WORK LISTED BELOW (per hour worked):
- Pile Driving/Dock Builder apprentices shall receive an additional $0.25 per hour worked when performing piledriving/dock building work.
- Certified Welders shall receive $3.00 per hour over the apprentices rate of pay when the apprentice is required to be certified and performs DOT, AWS or ABS specified welding work.
- When an apprentice performs work within a contaminated area on a State and/or Federally designated hazardous waste site, and where relevant State and/or Federal regulations require the apprentice to be furnished and use or wear required forms of personal protection, then the apprentice shall receive their regular hourly rate plus $1.50 per hour.

2-277B-Bro

Carpenter - Building / Heavy&Highway — 10/01/2026

JOB DESCRIPTION Carpenter - Building / Heavy&Highway **DISTRICT** 2

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

PARTIAL COUNTIES
Orange: The area lying on Northern side of Orange County demarcated by a line drawn from the Bear Mountain Bridge continuing west to the Bear Mountain Circle, continue North on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W, then east on County Road 107 to Route 32, then north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES

Wages per hour:	07/01/2026	07/01/2027 Additional
Carpenter - ONLY for Artificial Turf/Synthetic Sport Surface	$ 39.69	$ 2.25*

*To be allocated at a later date.

Note - Does not include the operation of equipment. Please see Operating Engineers rates.

SUPPLEMENTAL BENEFITS
Per hour worked:

Journeyworker	$ 27.84

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5) on HOLIDAY PAGE
Overtime: See (5, 6, 16) on HOLIDAY PAGE
Notes:
When a holiday falls upon a Saturday, it shall be observed on the preceding Friday. Whan a holiday falls upon a Sunday, it shall be observed on the following Monday.
An employee taking an unexcused day off the regularly scheduled day before or after a paid Holiday shall not receive Holiday pay.

REGISTERED APPRENTICES
Wages per hour (1300 hour terms at the following percentage of Journeyworker's wage):

1st	2nd	3rd	4th

65%	70%	75%	80%

Supplemental Benefits per hour worked:

$ 19.08	$ 19.69	$ 21.86	$ 22.47

2-42AtSS

Carpenter - Heavy&Highway 10/01/2026

JOB DESCRIPTION Carpenter - Heavy&Highway **DISTRICT** 2

ENTIRE COUNTIES
Broome, Cayuga, Chemung, Cortland, Delaware, Jefferson, Lewis, Onondaga, Oswego, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Yates

WAGES

Per hour	07/01/2026	07/01/2027 Additional
Carpenter	$ 41.02	$ 4.42*
Piledriver	41.02	4.42*
Dockbuilder	41.02	4.42*
Diver-Wet Day	66.02	4.42*
Diver-Dry Day	42.02	4.42*
Diver-Tender	42.02	4.42*

*To be allocated at a later date.

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (per hour worked):
- State or Federal designated hazardous site, requiring protective gear shall be an additional $2.50 per hour.
- Certified welders when required to perform welding work will receive an additional $5.00 per hour.

ADDITIONAL NOTES PERTAINING TO DIVERS/TENDERS:
- Divers and Tenders shall receive one and one half (1 1/2) times their regular diver and tender rate of pay for Effluent and Slurry diving.
- Divers and tenders being paid at the specified rate for Effluent and Slurry diving shall have all overtime rates based on the specified rate plus the appropriate overtime rates (one and one half or two times the specified rate for Slurry and Effluent divers and tenders).
- The pilot of an ADS or submersible will receive one and one-half (1 1/2) times the Diver-Wet Day Rate for time submerged.
- All crew members aboard a submersible shall receive the Diver-Wet Day rate.
- Depth pay for Divers based upon deepest depth on the day of the dive (per diem payment):
  - 0' to 50' no additional fee
  - 51' to 100' additional $0.50 per foot
  - 101' to 150' additional $0.75 per foot
  - 151' to 200' additional $1.25 per foot
  - 201' and deeper additional $1.50 per foot
- Penetration pay for Divers based upon deepest penetration on the day of the dive (per diem payment):
  - 0' to 50' no additional fee
  - 51' to 100' additional $0.75 per foot
  - 101' to 200' additional $1.00 per foot
  - Over 201' additional $1.25 per foot
- Diver rates applies to all hours worked on dive day.

SHIFT WORK
When project owner mandates a single irregular work shift, the Journeyworkers and Apprentices will receive an additional $4.00 per hour. A single irregular work shift can start any time from 5:00 p.m. to 1:00 a.m.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 27.81

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
- In the event a Holiday falls on a Saturday, the Friday before will be observed as a Holiday. If a Holiday falls on a Sunday, then Monday will be observed as a Holiday.
- The employee must work their scheduled workday before and their scheduled workday after the holiday to receive holiday pay.

REGISTERED APPRENTICES
CARPENTER/PILEDRIVER/DOCKBUILDER APPRENTICES
Wages per hour (1300 hour terms at the following percentage of journeyworker's base wage):

1st	2nd	3rd	4th
65%	70%	75%	80%

Supplemental Benefits per hour:

$ 19.05	$ 19.66	$ 21.78	$ 22.39

NOTE ADDITIONAL AMOUNTS PAID PER HOUR WORKED TO APPRENTICES FOR SPECIFIC TYPES OF WORK PERFORMED:
- State or Federal designated hazardous site, requiring protective gear shall be an additional $2.50 per hour.
- Certified welders when required to perform welding work will receive an additional $5.00 per hour.

2-277HH-Bro

Electrician — 10/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 6

ENTIRE COUNTIES

PARTIAL COUNTIES
Cayuga: Only the Township of Genoa.
Schuyler: Only the Townships of Cayuta, Catharine, and Hector.
Seneca: Only the Townships of Lodi and Covert.
Tioga: Only the Townships of Spencer and Candor.
Tompkins: Entire county except the Township of Groton.

WAGES

Per hour:	07/01/2026	06/01/2027 Additional
Electrician	$ 47.00	$ 4.50*

* To be allocated at a later date.

NOTE: Additional amounts, subject to overtime premiums, due for the following work (applicable to all employees):
-Additional $ 1.00 per hour for work from trusses, scaffolds, frames, spider baskets, ladders, etc. 40 feet or more from ground floor, or in underground mines or tunnels. Work done from personal lift equipment that complies with OSHA requirements are excluded.
-Additional $ 2.00 per hour when required to work under compressed air, on radio towers, on asbestos abatement projects which require the use of a respirator, work of a hazardous nature, work where gas masks are required or work requiring use of protective arc flash suits.

SHIFT WORK
The following rates will apply when shift work is mandated either in the job specification or by the contracting agency.

1ST SHIFT	8:00 AM to 4:30 PM	Regular wage rate
2ND SHIFT	4:30 PM to 1:00 AM	Regular wage rate plus 17.3%
3RD SHIFT	12:30 AM to 9:00 AM	Regular wage rate plus 31.4%

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 32.23 plus 3% of hourly wage paid*

*NOTE: The 3% is based on the hourly wage paid, straight time rate or premium time rate.

OVERTIME PAY
See (B, *E, Q) on OVERTIME PAGE
*NOTE: On Saturday the first 8 hours worked shall be paid at a rate of one and one-half times the applicable rate. All additional hours are payable at double the straight time rate.
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: When a holiday falls on a Saturday, the day preceding shall be celebrated as such, and when falling on a Sunday, Monday will be celebrated as the holiday.

REGISTERED APPRENTICES
WAGES per hour: One year terms at the following percentage of Journeyworker's wage.

1st year	50%
2nd year	55%
3rd year	65%
4th year	75%
5th year	85%

SUPPLEMENTAL BENEFITS per hour:

1st year	$ 14.93*
2nd year	14.93*
3rd year	25.63*
4th year	27.27*

5th year	27.92*

*NOTE: Plus 3% of hourly wage paid, straight time rate or premium time rate.

6-241

Electrician — 10/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 2

ENTIRE COUNTIES
Chemung, Steuben

PARTIAL COUNTIES
Allegany: Only the townships of Allen, Almond, Alfred, Andover, Birdsall, Burns, Granger, Grove, Hume, Independence, Ward, Wellsville, West Almond, Willing, and that portion of Amity, Angelica, Belfast, Caneadea, and Scio that lie east of the Genesee River.
Schuyler: Only the Townships of Dix, Montour, Orange, Reading and Tyrone.
Tioga: Only the Townships of Barton and Nichols.

WAGES

Per hour:	07/01/2026	05/31/2027 Additional	05/29/2028 Additional
Electrician (Base wage)	$ 46.40	$ 4.50*	$ 4.50*
Audio,Sound,Teledata	46.40	4.50*	4.50*

*To be allocated at a later date

ADDITIONAL AMOUNTS FOR SPECIFIC TYPES OF JOBSITE CONDITIONS (amount subject to any overtime premiums):
Additional $1.00 per hour for high work defined as work being done more than 35' above the floor where electricians are working on Tooth Picks, Structural Steel, Temporary Platforms, Swinging Scaffolds and Boatswain Chairs.
Additional $1.00 per hour for work in shafts 25' deep and in tunnels 50' long under construction.
Additional $2.00 per hour for work inside or on Towers, Smoke Stacks and Wind Turbine Generators over 100' high.
Additional $2.00 per hour for work in hazardous locations requiring supplied air (other than Class A) and any other type of respiratory equipment required for Class B or Class C as defined in OSHA Standards.
Additional $3.00 per hour for work in hazardous locations requiring Class A supplied air as defined in OSHA Standards.

SHIFT WORK
When shift work is mandated in the job specifications or by the contracting agency, the following journeyworker hourly rates apply. The starting hours of a shift may be adjusted up to two (2) hours in order to meet the needs of the contracting agency.

Between the hours of 8:00AM and 4:30PM	$ 46.40
Between the hours of 4:30PM and 1:00AM	52.20
Between the hours of 12:30AM and 9:00AM	58.00

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker
$ 23.32 plus $ 8.10* plus 3% of hourly wage
*Subject to SAME PREMIUM as overtime work

OVERTIME PAY
See (B, *E, Q) on OVERTIME PAGE
*Work performed on Saturday shall be paid at one and one-half of the hourly rate for the first ten hours, then two times the hourly rate therafter.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 23) on HOLIDAY PAGE
When the holiday falls on Saturday, it shall be recognized and celebrated as such on the Friday before and when the holiday falls on Sunday, it shall be recognized and celebrated as such on the following Monday (December 24th excluded).

REGISTERED APPRENTICES
WAGES: One year terms at the following percent of Journeyworker's wage.

1st	2nd	3rd	4th	5th
50%	55%	65%	75%	85%

ADDITIONAL AMOUNTS FOR SPECIFIC TYPES OF JOBSITE CONDITIONS (amount subject to any overtime premiums):
Additional $1.00 per hour for high work defined as work being done more than 35' above the floor where electricians are working on Tooth Picks, Structural Steel, Temporary Platforms, Swinging Scaffolds and Boatswain Chairs.
Additional $1.00 per hour for work in shafts 25' deep and in tunnels 50' long under construction.
Additional $2.00 per hour for work inside or on Towers, Smoke Stacks and Wind Turbine Generators over 100' high.

Additional $2.00 per hour for work in hazardous locations requiring supplied air (other than Class A) and any other type of respiratory equipment required for Class B or Class C as defined in OSHA Standards.
Additional $3.00 per hour for work in hazardous locations requiring Class A supplied air as defined in OSHA Standards.

SUPPLEMENTAL BENEFITS per hour:

1st term	$13.92 plus 3% of hourly wage
2nd term	$19.09 plus $4.46* plus 3% of hourly wage
3rd term	$20.03 plus $5.27* plus 3% of hourly wage
4th term	$20.97 plus $6.08* plus 3% of hourly wage
5th term	$21.91 plus $6.89* plus 3% of hourly wage

*Subject to SAME PREMIUM as overtime work

2-139

Electrician 10/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 2

ENTIRE COUNTIES
Broome

PARTIAL COUNTIES
Chenango: Entire County except the Townships of Columbus, New Berlin and Sherburne.
Delaware: Only the Townships of Davenport, Delhi, Deposit, Franklin, Hamden, Masonville, Meredith, Sidney, Tompkins and Walton Townships,and that portion of Colchester and Hancock Townships north of the east branch of the Delaware River.
Otsego: Only the Townships of Butternuts, Hartwick, Laurens, Maryland, Milford, Morris, Oneonta, Otego, Unadilla and Westford.
Tioga: Only the Townships of Berkshire, Newark Valley, Owego, Richford and Tioga.

WAGES

Per hour:	07/01/2026	06/01/2027 Additional	06/01/2028 Additional
Electrician (base wage)	$ 44.36	$3.31*	$3.86*
Cable Splicer	50.43	3.81*	4.36*

*To be allocated at a later date.

ADDITIONAL AMOUNTS FOR SPECIFIC TYPES OF JOBSITE CONDITIONS (amount subject to any overtime premiums):
Additional $ 0.50 per hour when required to work underground, such as in tunnels for roads, railroads, or water.
Additional $ 0.50 per hour when required to work at a height of 40 feet above the ground or roof level.

SHIFT WORK
When shift work is mandated in the job specifications or by the contracting agency, the following journeyworker hourly rates apply. The starting hours of a shift may be adjusted up to two (2) hours in order to meet the needs of the contracting agency.

Between the hours of 8:00AM and 4:30PM	$ 44.36
Between the hours of 4:30PM and 1:00AM	52.03
Between the hours of 12:30AM and 9:00AM	58.29

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 33.38 plus 3% of wage

OVERTIME PAY
See (B, *E, Q) on OVERTIME PAGE
*Double time after 8 hours on Saturday.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, *8, 16) on HOLIDAY PAGE
When a dated holiday falls on a Saturday it shall be celebrated on Friday. When a dated holiday falls on a Sunday, it shall be celebrated on Monday.
*Good Friday may be celebrated the following Monday by mutual agreement of Employer and Employees.

REGISTERED APPRENTICES
WAGES: Terms at the following percentages of Journeyworker's wage.

1st	2nd	3rd	4th	5th
0-2000 Hrs	2000-3500 Hrs	3500-5000 Hrs	5000-6500 Hrs	6500-8000 Hrs
46%	51%	59%	69%	79%

ADDITIONAL AMOUNTS FOR SPECIFIC TYPES OF JOBSITE CONDITIONS (amount subject to any overtime premiums):
Additional $ 0.50 per hour when required to work underground, such as in tunnels for roads, railroads, or water.
Additional $ 0.50 per hour when required to work at a height of 40 feet above the ground or roof level.

SUPPLEMENTAL BENEFITS per hour:

1st term	$ 10.75 plus 3% of the hourly wage
2nd term	$ 28.72 plus 3% of the hourly wage
All other terms	$ 29.43 plus 3% of the hourly wage

2-325

Elevator Constructor — 10/01/2026

JOB DESCRIPTION Elevator Constructor **DISTRICT** 6

ENTIRE COUNTIES
Broome, Cayuga, Chenango, Cortland, Franklin, Jefferson, Lewis, Onondaga, Oswego, St. Lawrence, Tioga, Tompkins

PARTIAL COUNTIES
Delaware: Only the towns of: Tompkins, Walton, Masonville, Sidney, Franklin and Deposit.
Madison: Only the towns of: Cazenovia, DeRuyter, Eaton, Fenner, Georgetown, Lebanon, Lenox, Nelson and Sullivan.
Oneida: Only the towns of: Camden, Florence and Vienna.

WAGES

Per hour:	07/01/2026	01/01/2027
Mechanic	$ 60.99	$ 63.706
Mechanic Helper	42.69	44.594

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker	$ 38.985*	39.535*

*NOTE: Add 6% of regular hourly rate for all hours worked. Add 8% of regular hourly rate if more than 5 years of service.

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 15, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE
NOTE: When a holiday falls on a Saturday, it shall be observed on Friday. When a holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES
WAGES per hour: 1 year terms at the following percentage of the Elevator Constructor Mechanic wage.

0-6 months	6-12 months	2nd year	3rd year	4th year
50%	55%	65%	70%	80%

SUPPLEMENTAL BENEFITS per hour:

0-6 months: 6% of the regular hourly apprentice rate paid, no additional supplemental benefits.

All other terms: Same as Journeyworker

6-62.1

Glazier — 10/01/2026

JOB DESCRIPTION Glazier **DISTRICT** 5

ENTIRE COUNTIES
Broome, Chemung, Chenango, Delaware, Otsego, Schuyler, Steuben, Tioga, Tompkins

WAGES

Per hour:	07/01/2026
Glazier	$ 33.00

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker	$ 34.15

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
1000 hour terms

Appr. 1st term	$ 21.00
Appr. 2nd term	22.00
Appr. 3rd term	23.00
Appr. 4th term	24.00
Appr. 5th term	25.00
Appr. 6th term	26.00
Appr. 7th term	27.00
Appr. 8th term	28.00

Supplemental Benefits per hour:

Appr. 1st term	$ 13.27
Appr. 2nd term	13.27
Appr. 3rd term	19.27
Appr. 4th term	19.27
Appr. 5th term	20.27
Appr. 6th term	20.27
Appr. 7th term	21.27
Appr. 8th term	21.27

5-677z3

Insulator - Heat & Frost — 10/01/2026

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 7

ENTIRE COUNTIES
Broome, Cayuga, Chemung, Chenango, Cortland, Herkimer, Jefferson, Lewis, Madison, Oneida, Onondaga, Oswego, Otsego, Schuyler, Seneca, St. Lawrence, Tioga, Tompkins

WAGES

Per hour:	07/01/2026	05/01/2027 Additional	05/01/2028 Additional	05/01/2029 Additional
ON MECHANICAL SYSTEMS ONLY:				
Asbestos Worker	$ 45.75	$ 4.50*	$ 4.75*	$ 6.25*
Insulation Installer	45.75	4.50*	4.75*	6.25*
Firestopping Worker	45.75	4.50*	4.75*	6.25*

* To be allocated at a later date.

SHIFT WORK
The following rates will apply on all contracting agency-mandated shifts worked:

1st Shift	$ 45.75
2nd Shift	52.61
3rd Shift	54.90

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 28.59

OVERTIME PAY
See (*B1, **K, P) on OVERTIME PAGE
*NOTE: First 10 hours on Saturday.
**NOTE: Holidays that fall on Sunday are subject to double time.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (2*,4,6,28) on HOLIDAY PAGE
*Triple time for Labor Day if worked.

REGISTERED APPRENTICES
WAGES per hour: One (1) year terms at the following percentage of Journeyworker's wage.

1st	2nd	3rd	4th

60%	70%	80%	90%

SUPPLEMENTAL BENEFITS per hour:

$ 24.24	$ 24.24	$ 28.59	$ 28.59

7-30-Syracuse

Ironworker — 10/01/2026

JOB DESCRIPTION Ironworker **DISTRICT** 6

ENTIRE COUNTIES
Broome, Cayuga, Cortland, Onondaga, Oswego, Seneca, Tioga, Tompkins

PARTIAL COUNTIES
Chenango: Only the townships of Afton, Bainbridge, Coventry, German, Greene, Guilford, Lincklaen, McDonough, Norwich, Otselic, Oxford, Pharsalia, Pitcher, Preston and Smithville.
Jefferson: Only the townships of Adams, Alexandria, Brownville, Cape Vincent, Clayton, Ellisburg, Henderson, Hounsfield, LeRay, Lorraine, Lyme, Orleans, Pamelia, Rodman, Rutland, Theresa, Watertown and Worth.
Madison: Only the townships of Cazenovia, DeRuyter, Fenner, Georgetown, Lenox, Lincoln, Nelson, Smithfield and Sullivan.
Schuyler: Only the townships of Cayuta, Catharine, Hector and Montour.
Wayne: Only the townships of Butler, Galen, Huron, Rose, Savannah and Wolcott.

WAGES
Structural, Reinforcing, Re-bar, Machinery Mover & Rigger, Ornamental & Curtain Wall, Window Wall, Pre-Glazed Metal Framed Windows Attached to Steel or Masonry Including Caulking, Fence Erector (Chain Link/Security), Sheeter/Bridge Rail, Pre-Cast Erector, Stone Derrickman, Pre-Engineered Building Erector, Welder

Per hour:	07/01/2026
Ironworker	$ 38.50

SHIFT WORK
Multiple shifts mandated by the project owner. All shifts will be eight (8) hours.

1st Shift	Regular wage rate	
2nd Shift	Regular wage rate plus 10% -	Starting times between 2 PM and 7 PM
3rd Shift	Regular wage rate plus 15% -	Starting times between 7 PM and 12 AM

NOTE: When a single irregular shift is worked, with start times based on second or third shifts, add 10% to the 1st shift wage rate posted above.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 33.30

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6) on HOLIDAY PAGE

NOTE: Any holiday which occurs on Saturday shall be observed on the preceding Friday. Any holiday which occurs on Sunday shall be observed the following Monday.

REGISTERED APPRENTICES
WAGES per hour: One year terms at the following rates.

1st	2nd	3rd	4th
$ 21.50	$ 23.50	$ 25.50	$ 27.50

SUPPLEMENTAL BENEFITS per hour:

1st year	$ 13.28
2nd year	21.82
3rd year	23.04
4th year	24.26

6-60

Laborer - Building — 10/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 2

ENTIRE COUNTIES

Broome, Chemung, Cortland, Schuyler, Steuben, Tioga, Tompkins

PARTIAL COUNTIES
Chenango: Entire County except the Townships of Sherburne, Columbus and New Berlin.
Delaware: Only the Townships of Sidney, Masonville, Walton, Tompkins, Deposit, Hancock, and Colchester.

WAGES
Per hour:

GROUP #1: Basic Laborer - excavation, concrete vibrator, power-driven buggie, demolition (including acetylene torch work) that is customarily done by a laborer

GROUP #2: Air Tool Operators, Mason Tenders

GROUP #3: Blaster, Rock Drill (compressor driven)

GROUP #4: Asbestos, Hazardous, Toxic Waste, Lead and Mold Remediation

	07/01/2026
GROUP #1	$ 31.25
GROUP #2	32.25
GROUP #3	33.25
GROUP #4	33.25

IMPORTANT NOTES:
- Laborer tasks on Renewable Energy and Green Energy construction work shall be paid at the appropriate Heavy & Highway rates.
- Wage and supplement rates for the operation of forklift and skid steer may be found under the classification "Operating Engineer".

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 20.20

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
When a holiday falls on Sunday, it shall be observed on the following Monday.

REGISTERED APPRENTICES
WAGES: 1000 hour terms at the following percentage of Journeyworker's wage.

1st	2nd	3rd	4th
70%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

1st term	$ 15.85
2nd term	17.10
3rd term	17.98
4th term	18.85

2-785b

Laborer - Heavy&Highway **10/01/2026**

JOB DESCRIPTION Laborer - Heavy&Highway **DISTRICT** 2

ENTIRE COUNTIES
Broome, Chemung, Cortland, Schuyler, Steuben, Tioga, Tompkins

PARTIAL COUNTIES
Chenango: Entire County except the Townships of Sherburne, Columbus, and New Berlin.
Delaware: Only the Townships of Sidney, Masonville, Walton, Tompkins, Deposit, Hancock and Colchester.

WAGES
Per hour:

GROUP A: Drill Helper, Flagman, Outboard and Hand Boats.

GROUP B: Basic Rate, Bull Float (where used for strike off only), Chain Saw, Concrete Aggregate Bin, Concrete Bootmen, Gin Buggy, Hand or Machine Vibrator, Jack Hammer, Mason Tender, Mortar Mixer, Pavement Breaker, Handlers of Steel Mesh, Small Generators for Laborers Tools, Installation of Bridge Drainage Pipe, Pipe Layers, Vibrator Type Rollers, Tamper, Drill Doctor, Water Pump Operators (1-1/2" & Single Diaphragm), Nozzle (Asphalt, Gunite, Seeding, and Sand Blasting), Laborers on Chain Link Fence Erection, Rock Splitter and Power Unit, Pusher Type Concrete Saw and all other Gas, Electric, and Air Tool Operators, Wrecking Laborer.

GROUP C: Drilling equipment - only where a separate air compressor unit supplies power, Acetylene Torch Operators, Asphalt Raker, Powder Man, Tail or Screw Operator on Asphalt Paver.

GROUP D: Blasters, Form Setters (slab steel forms on highways, roads, streets & airport runways), Stone or Granite Curb Setters.

GROUP E: Hazardous Waste defined as when an employee performs hazardous waste removal, lead abatement and removal, asbestos abatement and removal work on State and/or Federally designated waste site and were relevant State and/or Federal regulations require employees to use or wear required forms of personal protection.

	07/01/2026	07/01/2027 Additional
GROUP A	$ 39.80	$ 4.20*
GROUP B	40.00	4.20*
GROUP C	40.20	4.20*
GROUP D	40.40	4.20*
GROUP E	45.00	4.20*

*To be allocated at a later date.

IMPORTANT NOTES:
- Laborer tasks on Renewable Energy and Green Energy construction work shall be paid at the appropriate Heavy & Highway rates.
- Wage and supplement rates for the operation of forklift and skid steer may be found under the classification "Operating Engineer".

SHIFT WORK
A single irregular work shift starting any time between 5:00 PM and 1:00 AM on governmental mandated night work shall be paid an additional $5.00 per hour.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 28.01

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
- If Holiday falls on Sunday, it will be celebrated on Monday. If the Holiday falls on Saturday, it will be celebrated on Saturday.
- An Employee must work the scheduled working day before and the scheduled working day after a holiday to receive holiday pay.

REGISTERED APPRENTICES
WAGES: 1000 hour terms at the following percentage of Journeyworker's GROUP B wage:

1st	2nd	3rd	4th
70%	80%	90%	95%

SUPPLEMENTAL BENEFITS per hour:
All terms $ 28.01

2-785h

Laborer - Tunnel 10/01/2026

JOB DESCRIPTION Laborer - Tunnel **DISTRICT** 2

ENTIRE COUNTIES
Broome, Chemung, Cortland, Schuyler, Steuben, Tioga, Tompkins

PARTIAL COUNTIES
Chenango: Entire County except the Townships of Sherburne, Columbus, and New Berlin.
Delaware: Only the Townships of Sidney, Masonville, Walton, Tompkins, Deposit, Hancock and Colchester.

WAGES
Per hour:

GROUP A: Change House Man

GROUP B: Miners and all Machine Men, Safety Miner, All Shaft work, Caisson work, Drilling, Blow Pipe, all Air Tools, Tugger, Scaling, Nipper, Guniting pot to nozzle, Bit Grinder, Signal Man (top and bottom), Concrete Man, Shield Driven Tunnels, mixed face and soft ground, liner plate tunnels in free air.

GROUP C: Blaster

GROUP D: Hazardous waste removal work on a State and/or Federally designated waste site where relevant State and/or Federal regulations require employees to use or wear required forms of personal protection.

	07/01/2026	07/01/2027 Additional
Group A	$ 42.98	$ 4.20*
Group B	43.18	4.20*
Group C	47.98	4.20*
Group D	47.98	4.20*

*To be allocated at a later date

IMPORTANT NOTES:
- When an employee is required by the employer and/or by the material data safety sheets of a product, during its application, to wear a half or full face replaceable cartridge respirator for more then (2) hours, then in such case said employee(s) will be paid the Group D rate for the shift.

SHIFT WORK
A single irregular work shift starting any time between 5:00 PM and 1:00 AM on governmental mandated night work shall be paid an additional $5.00 per hour.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 28.01

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
- If Holiday falls on Sunday, it will be celebrated on Monday. If the Holiday falls on Saturday, it will be celebrated on Friday.

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
If the holiday falls on Saturday, it will be celebrated on Friday. If the holiday falls on Sunday, it will be celebrated on Monday

REGISTERED APPRENTICES
WAGES: 1000 hour terms at the following percentage of Group B wage

1st	2nd	3rd	4th
70%	80%	90%	95%

SUPPLEMENTAL BENEFITS per hour:

All Terms $ 28.01

2-785T

Lineman Electrician 10/01/2026

JOB DESCRIPTION Lineman Electrician **DISTRICT** 6

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES
A Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors, assembly of all electrical materials, conduit, pipe, or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

Crane Operators: Operation of any type of crane on line projects.
Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on line projects.
Digging Machine Operator: All other digging equipment and augering on line projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines. Also includes digging of holes for poles, anchors, footer, and foundations for electrical equipment.

-----Below rates applicable on all overhead and underground distribution and maintenance work, and all overhead and underground transmission line work and the installation of fiber optic cable where no other construction trades are or have been involved. Includes access matting for line work.

Per hour:	07/01/2026	05/03/2027	05/01/2028
Group A:			
Lineman, Technician	$ 64.37	$ 66.84	$ 69.47
Crane, Crawler Backhoe	64.37	66.84	69.47
Welder, Cable Splicer	64.37	66.84	69.47
Group B:			
Digging Mach. Operator	$ 57.93	$ 60.16	$ 62.52
Group C:			
Tractor Trailer Driver	$ 54.71	$ 56.81	$ 59.05
Groundman, Truck Driver	51.50	53.47	55.58
Equipment Mechanic	51.50	53.47	55.58
Group D:			
Flagger	$ 35.40	$ 36.76	$ 38.21

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 03, 2027.

-----Below rates applicable on all electrical sub-stations, switching structures, fiber optic cable and all other work not defined as "Utility outside electrical work." Includes access matting for line work.

Group A:			
Lineman, Technician	$ 64.37	$ 66.84	$ 69.47
Crane, Crawler Backhoe	64.37	66.84	69.47
Cable Splicer	70.81	73.52	76.42
Certified Welder, Pipe Type Cable	$ 67.59	$ 70.18	$ 72.94
Group B:			
Digging Mach. Operator	$ 57.93	$ 60.16	$ 62.52
Group C:			
Tractor Trailer Driver	$ 54.71	$ 56.81	$ 59.05
Groundman, Truck Driver	51.50	53.47	55.58
Equipment Mechanic	51.50	53.47	55.58
Group D:			
Flagger	$ 35.40	$ 36.76	$ 38.12

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 03, 2027.

-----Below rates applicable on all railroad catenary installation and maintenance, third rail installation, bonding of rails and pipe type cable and installation of fiber optic cable. Includes access matting for line work.

Group A:			
Lineman, Tech, Welder	$ 65.81	$ 68.34	$ 71.03
Crane, Crawler Backhoe	65.81	68.34	71.03
Cable Splicer	72.39	75.17	78.13
Certified Welder, Pipe Type Cable	69.10	71.76	74.58

Group B:			
Digging Mach. Operator	$ 59.23	$ 61.51	$ 63.93
Group C:			
Tractor Trailer Driver	$ 55.94	$ 58.09	$ 60.38
Groundman, Truck Driver	52.65	54.67	56.82
Equipment Mechanic	52.65	54.67	56.82
Group D:			
Flagger	$ 36.20	$ 37.59	$ 39.07

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 03, 2027.

-----Below rates applicable on all overhead and underground transmission line work & fiber optic cable where other construction trades are or have been involved. This applies to transmission line work only, not other construction. Includes access matting for line work.

Group A:			
Lineman, Tech, Welder	$ 67.10	$ 69.68	$ 72.43
Crane, Crawler Backhoe	67.10	69.68	72.43
Group B:			
Digging Mach. Operator	$ 60.39	$ 62.71	$ 65.19
Group C:			
Tractor Trailer Driver	$ 57.04	$ 59.23	$ 61.57
Groundman, Truck Driver	53.68	55.74	57.94
Equipment Mechanic	53.68	55.74	57.94
Group D:			
Flagger	$ 36.91	$ 38.32	$ 39.84

Additional 3% per hour above regular rate for entire crew when a helicopter is used. This will increase to 5% on May 03, 2027.

SHIFT WORK

The following rates will apply on all contracting agency mandated multiple shifts of at least five (5) days duration worked between the hours listed below:

1ST SHIFT	8:00 AM to 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM to 1:00 AM REGULAR RATE PLUS 17.3 %
3RD SHIFT	12:30 AM to 9:00 AM REGULAR RATE PLUS 31.4 %

SUPPLEMENTAL BENEFITS

Per hour:

	07/01/2026	05/03/2027	05/01/2028
Group A	$ 32.91*	$ 34.41*	$ 35.91*
Group B	$ 28.91*	$ 30.41*	$ 31.91*
Group C	$ 28.51*	$ 29.71*	$ 30.91*
Group D	$ 28.41*	$ 29.54*	$ 30.67*

*NOTE: Plus 7% of the hourly wage paid. The 7% is based on the straight time rate or the premium time rate.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Contracting Agency.
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid	See (5, 6, 8, 15, 25) on HOLIDAY PAGE
Overtime	See (5, 6, 8, 15, 25) on HOLIDAY PAGE

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

	07/01/2026	05/03/2027	05/01/2028
All terms:	$ 28.41*	$ 29.54*	$ 30.67*

*NOTE: Plus 7% of the hourly wage paid. The 7% is based on the straight time rate or the premium time rate.

6-1249a

Lineman Electrician - Teledata — 10/01/2026

JOB DESCRIPTION Lineman Electrician - Teledata **DISTRICT** 6

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES
NOTE: Applies to all public work and covered private projects, including those receiving ConnectAll funding subject to LL 224-E,solicited prior to July 1, 2025. For all projects, excluding dial-up internet access service, solicited on or after July 1, 2025, please see BROADBAND

Per hour:	07/01/2026	01/04/2027	01/03/2028	01/01/2029
Cable Splicer	$ 42.03	$ 43.30	$ 44.59	$ 45.93
Installer, Repairman	39.89	41.09	42.32	43.59
Teledata Lineman	39.89	41.09	42.32	43.59
Tech., Equip. Operator	39.89	41.09	42.32	43.59
Groundman/Flagger	21.14	21.78	22.43	23.10

For outside work, stopping at first point of attachment (demarcation).

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work, please see LINEMAN.

SHIFT WORK
The following rates apply when the contracting agency mandates multiple shifts of at least five (5) days duration are worked. When two (2) or three (3) shifts are worked the following rates apply:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 6.18 plus 4%*	$ 6.43 plus 5%*	$ 6.43 plus 6%*	$ 6.68 plus 7%*

*NOTE: The percentage (%) listed above is based on the hourly wage paid, straight time rate or premium time rate.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16) on HOLIDAY PAGE

6-1249LT - Teledata

Lineman Electrician - Traffic Signal, Lighting — 10/01/2026

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting **DISTRICT** 6

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Warren, Washington, Wayne, Wyoming, Yates

WAGES

Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

Crane Operators: Operation of any type of crane on Traffic Signal/Lighting projects.
Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on Traffic Signal/Lighting projects.
Digging Machine Operator: All other digging equipment and augering on Traffic Signal/Lighting projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.

Per hour:	07/01/2026	05/03/2027	05/01/2028
Group A:			
Lineman, Technician	$ 55.31	$ 57.40	$ 59.64
Crane, Crawler Backhoe	55.31	57.40	59.64
Certified Welder	58.08	60.27	62.62
Group B:			
Digging Machine	$ 49.78	$ 51.66	$ 53.68
Group C:			
Tractor Trailer Driver	$ 47.01	$ 48.79	$ 50.69
Groundman, Truck Driver	44.25	45.92	47.71
Equipment Mechanic	44.25	45.92	47.71
Group D:			
Flagger	$ 33.19	$ 34.44	$ 35.78

Above rates are applicable for installation, testing, operation, maintenance and repair on all Traffic Control (Signal) and Illumination (Lighting) projects, Traffic Monitoring Systems, and Road Weather Information Systems. Includes digging of holes for poles, anchors, footer foundations for electrical equipment; assembly of all electrical materials or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

SHIFT WORK

The following rates will apply on all contracting agency mandated multiple shifts of at least five (5) days duration worked between the hours listed below:

1ST SHIFT	8:00 AM TO 4:30 PM	REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM	REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM	REGULAR RATE PLUS 31.4%

SUPPLEMENTAL BENEFITS

Per hour:

	07/01/2026	05/03/2027	05/01/2028
Group A	$ 32.91*	$ 34.41*	$ 35.91*
Group B	$ 28.91*	$ 30.41*	$ 31.91*
Group C	$ 28.51*	$ 29.71*	$ 30.91*
Group D	$ 28.41*	$ 29.54*	$ 30.67*

*NOTE: Plus 7% of the hourly wage paid. The 7% is based on the straight time rate or the premium time rate.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE.
NOTE: Double time for all emergency work designated by the Contracting Agency.
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25) on HOLIDAY PAGE

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES
WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

	07/01/2026	05/03/2027	05/01/2028
All terms:	$ 28.41*	$ 29.54*	$ 30.67*

*NOTE: Plus 7% of the hourly wage paid. The 7% is based on the straight time rate or the premium time rate.

6-1249a-LT

Lineman Electrician - Tree Trimmer — 10/01/2026

JOB DESCRIPTION Lineman Electrician - Tree Trimmer **DISTRICT** 6

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES
Applies to line clearance, tree work and right-of-way preparation on all new or existing energized overhead or underground electrical, telephone and CATV lines. This also includes stump removal near underground energized electrical lines including telephone and CATV lines.

Per hour:	07/01/2026	01/01/2027	01/03/2027
Tree Trimmer	$ 34.67	$ 34.67	$ 36.23
Equipment Operator	30.67	30.67	32.05
Equipment Mechanic	30.67	30.67	32.05
Truck Driver	24.93	24.93	26.05
Groundman	20.53	20.53	21.45
Flagger	16.20	16.20*	16.93

* This rate may be subject to a minimum wage increase 01/01/2027.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 11.23*	$ 11.48*	$ 11.48*

*NOTE: Plus 4.5% of the hourly wage paid. The 4.5% is based on the straight time rate or the premium time rate.

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (5, 6, 8, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 16, 25) on HOLIDAY PAGE
NOTE: All paid holidays falling on a Saturday shall be observed on the preceding Friday. All paid holidays falling on a Sunday shall be observed on the following Monday.

6-1249TT

Mason - Building — 10/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 5

ENTIRE COUNTIES
Broome, Chenango, Delaware, Otsego, Tioga

WAGES
Per hour: 07/01/2026

Building:

Bricklayer, Cement	$ 36.34
Mason, Plasterer, Stone	
Mason, Tuck Pointer	

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 31.26

OVERTIME PAY
See (B,E,E2*,Q) on OVERTIME PAGE
*Note - Or other conditions beyond the employer's control such as fire or natural disaster.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:

One year terms at the following rates:

1st	2nd	3rd	4th
$ 22.99	$ 28.44	$ 29.82	$ 32.71

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 24.52	$ 25.75	$ 28.84	$ 30.42

5-3B - Bing - Z2

Mason - Heavy&Highway — 10/01/2026

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT** 5

ENTIRE COUNTIES
Allegany, Broome, Chautauqua, Chemung, Chenango, Cortland, Delaware, Genesee, Livingston, Monroe, Ontario, Orleans, Otsego, Schuyler, Seneca, Steuben, Tioga, Tompkins, Wayne, Wyoming, Yates

PARTIAL COUNTIES
Cattaraugus: Enitre county except in the Township of Perrysburg and the Village of Gowanda only the Bricklayer classification applies.
Erie: Only the Bricklayer classification applies.
Niagara: Only the Bricklayer classification applies.

WAGES
Per hour: 07/01/2026
Heavy & Highway:

Cement Mason	$ 41.38
Bricklayer	41.38

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 27.03

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:

1500 hour terms at the following percentage of Journeyworker's wage:

1st	2nd	3rd	4th
50%	60%	70%	80%

Supplemental benefits per hour:

1st term	$ 15.78
2nd term	$ 25.07

3rd term	$ 25.56
4th term	$ 26.05

5-3h

Mason - Tile Finisher — 10/01/2026

JOB DESCRIPTION Mason - Tile Finisher **DISTRICT** 5

ENTIRE COUNTIES
Broome, Chemung, Chenango, Cortland, Delaware, Otsego, Schuyler, Steuben, Tioga, Tompkins

PARTIAL COUNTIES
Allegany: Towns of Alfred, Almond, Andover and Burns in Allegany County

WAGES

Wages	
Per hour:	07/01/2026
Building:	
Marble, Slate, Terrazzo and Tile Finisher	$ 35.00

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 24.47

OVERTIME PAY
See (B,E,E2*,Q) on OVERTIME PAGE
*Note - Or other conditions beyond the employer's control such as fire or natural disaster.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:

One year terms at the following wage:

1st	2nd	3rd
$ 21.00	$ 24.50	$ 28.00

Supplemental benefits per hour:

1st	2nd	3rd
$ 15.69	$ 16.39	$ 21.13

5-3TF - Z4

Mason - Tile Setter — 10/01/2026

JOB DESCRIPTION Mason - Tile Setter **DISTRICT** 5

ENTIRE COUNTIES
Broome, Chemung, Chenango, Cortland, Delaware, Otsego, Schuyler, Steuben, Tioga, Tompkins

PARTIAL COUNTIES
Allegany: Towns of Alfred, Almond, Andover and Burns.

WAGES

Wages	
Per Hour:	07/01/2026
Building:	
Marble, Slate, Terrazzo and Tile Setter	$ 36.69

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 28.56

OVERTIME PAY
See (B,E,E2*,Q) on OVERTIME PAGE
*Note - Or other conditions beyond the employer's control such as fire or natural disaster.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:

One year terms at the following wage:

1st	2nd	3rd	4th
$ 22.01	$ 25.68	$ 29.35	$ 33.02

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 16.49	$ 17.31	$ 26.90	$ 27.73

5-3TS - Z4

Millwright 10/01/2026

JOB DESCRIPTION Millwright **DISTRICT** 6

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES
THE FOLLOWING RATE APPLIES TO ANY GAS/STEAM TURBINE AND OR RELATED COMPONENT WORK, INCLUDING NEW INSTALLATIONS OR MAINTENANCE AND ANY/ALL WORK PERFORMED WITHIN THE PROPERTY LIMITS OF A NUCLEAR FACILITY.

Per hour:	07/01/2026	07/01/2027 Additional	07/01/2028 Additional
Millwright - Power Generation	$ 50.00	$ 3.00*	$ 3.00*

* To be allocated at a later date.

NOTE: ADDITIONAL PREMIUMS PAID FOR THE FOLLOWING WORK LISTED BELOW (amount subject to any overtime premiums):
- Certified Welders shall receive an additional $ 1.75 per hour provided they are directed to weld.
- If a work site has been declared a hazardous site by the Owner and the use of protective gear (including, as a minimum, air purifying canister-type chemical respirators) is required, then that employee shall receive an additional $ 1.50 per hour.
- An employee performing the work of a machinist shall receive an additional $ 2.00 per hour. For the purposes of this premium to apply, a "machinist" is a person who uses a lathe, Bridgeport, milling machine or similar type of tool to make or modify parts.
- When performing work underground at 500 feet and below, the employee shall receive an additional $ 1.00 per hour.

SUPPLEMENTAL BENEFITS
Per hour paid:

Journeyworker	$ 28.45*

*NOTE: Subject to OT premium

OVERTIME PAY
See (B, E, E2, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: Any holiday that falls on Sunday shall be observed the following Monday. Any holiday that falls on Saturday shall be observed the preceding Friday.

REGISTERED APPRENTICES
WAGES per hour: One year terms at the following percentage of Journeyworker's wage:

Appr. 1st year	65%*
Appr. 2nd year	75%*
Appr. 3rd year	80%*
Appr. 4th year	90%*

*NOTE: Additional premium for the following work listed below:

Certified Welder	$ 1.75
Hazardous Waste Work	1.50
Machinist	2.00
Underground (500' and below)	1.00

SUPPLEMENTAL BENEFITS per hour:

Appr. 1st year	$ 11.96
Appr. 2nd year	23.50
Appr. 3rd year	25.15
Appr. 4th year	26.80

6-1163Power

Millwright 10/01/2026

JOB DESCRIPTION Millwright **DISTRICT** 6

ENTIRE COUNTIES
Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Herkimer, Madison, Seneca, Tioga, Yates

WAGES

Per hour:	07/01/2026	07/01/2027 Additional	07/01/2028 Additional
Building	$ 40.50	$ 3.50*	$ 3.50*
Heavy & Highway	44.00		

* To be allocated at a later date.

NOTE: ADDITIONAL PREMIUMS PAID FOR THE FOLLOWING WORK LISTED BELOW (amount subject to any overtime premiums):
- Certified Welders shall receive an additional $ 1.75 per hour provided they are directed to weld.
- On Building projects, If a work site has been declared a hazardous site by the Owner and the use of protective gear (including, as a minimum, air purifying canister-type chemical respirators) are required, then that employee shall receive an additional $ 1.50 per hour.
- H/H work performed on hazardous waste sites where employees are required to wear protective gear shall receive an additional $ 2.00 per hour over the Millwright H/H rate for all hours worked on the day protective gear was worn.
- An employee performing the work of a machinist shall receive an additional $ 2.00 per hour. For the purposes of this premium to apply, a "machinist" is a person who uses a lathe, Bridgeport, milling machine or similar type of tool to make or modify parts.
- When performing work underground at 500 feet and below, the employee shall receive an additional $ 1.00 per hour.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 27.54

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: Any holiday that falls on Sunday shall be observed the following Monday. Any holiday that falls on a Saturday shall be observed the preceding Friday.

REGISTERED APPRENTICES
WAGES per hour: One year terms at the following percentage of Journeyworker's wage:

Appr. 1st year	65%*
Appr. 2nd year	75%*
Appr. 3rd year	80%*
Appr. 4th year	90%*

*NOTE: Additional premium for the following work listed below:

Certified Welder	$ 1.75
Hazardous Waste (Bldg)	1.50
Hazardous Waste (H/H)	2.00
Machinist	2.00
Underground (500' and below)	1.00

SUPPLEMENTAL BENEFITS per hour:

Appr. 1st year	$ 11.96
Appr. 2nd year	22.86
Appr. 3rd year	24.42
Appr. 4th year	25.98

6-1163 Zone 2

Operating Engineer - Building — 10/01/2026

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 1

ENTIRE COUNTIES
Broome, Chenango, Tioga

WAGES
NOTE:
-- In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.
-- If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C

CLASS A1**: All cranes that require A NYS crane license, tower cranes***(including self erecting), hydraulic cranes, locomotive crane, piledriver, cableway, derricks, whirlies, dragline, boom trucks over 5 tons, cherry pickers, overhead cranes (gantry or saddle type), truck cranes

CLASS A:
Shovel, Excavators 18,001 lbs. and above(including rubber tire full swing), Gradalls, power road grader, all CMI equipment, front-end rubber tire loader, tractor-mounted drill (quarry master), mucking machine, concrete central mix plant, concrete pump, belcrete system, automated asphalt concrete plant, and tractor road paver, boom trucks 5 tons and under, maintenance engineer, self-contained crawler drill-hydraulic rock drill, Profiler/Milling machine.

CLASS B:
Excavators 18,000 lbs. and under, Backhoes (rubber tired backhoe/loader combination), bulldozer, pushcat, tractor, traxcavator, scraper, LeTourneau grader, form fine grader, self-propelled soil compactor (fill roller), asphalt roller, blacktop spreader, power brooms, sweepers, trenching machine, Barber Green loader, side booms, hydro hammer, concrete spreader, concrete finishing machine, one drum hoist, power hoisting (single drum), hoist two drum or more, three drum engine, power hoisting (two drum and over), two drum and swinging engine, three drum swinging engine, hod hoist, A-L frame winches, core and well drillers (one drum), post hole digger, model CHB Vibro-Tamp or similar machine, batch bin and plant operator, dinky locomotive, skid steer loader, track excavator 5/8 cubic yard or smaller, front end rubber tired loader under four cubic yards, vacum machine (mounted or towed).

CLASS C:
Fork lift, high lift, all terrain fork lift: or similar, oiler, fireman and heavy-duty greaser, boilers and steam generators, pump, vibrator, motor mixer, air compressor, dust collector, welding machine, well point, mechanical heater, generators, temporary light plants, electric submersible pumps 4" and over, murphy type diesel generator, conveyor, elevators, concrete mixer, beltcrete power pack (belcrete system), seeding, and mulching machines, pumps, rotating telehandler (that does not require NYS crane license).

WAGES per hour

	07/01/2026	07/01/2027	07/01/2028	07/01/2029
Building		Additional	Additional	Additional
Class A1**	$ 57.45	$ 5.03*	$ 5.62*	$ 5.61*
Class A	$ 53.01	5.00*	5.60*	6.10*
Class B	$ 52.42	4.87*	5.45*	5.95*
Class C	$ 49.96	4.72*	5.32*	5.79*

(*) To be allocated at a later date

Additional $2.50 per hr over B rate for Nuclear Leader work.
Additional $2.50 per hour if work requires Personal Protective Equipment for hazardous waste site activities with a level C or over rating.

(**)TONNAGE RATING PREMIUMS:
Note: Additional value subject to same premiums as shown for OT
All cranes 1000 tons and over, A1 rate plus $7.00
All cranes 800-999 tons, A1 rate plus $6.00
All cranes 600-799 tons, A1 rate plus $5.00
All cranes 400-599 tons, A1 rate plus $4.00
All cranes 200-399 tons, A1 rate plus $3.00
All cranes 111-199 tons, A1 rate plus $2.25
All cranes 110 tons and under, A1 rate only

(***)Tower Cranes - A1 rate plus $ 0.50 (no tonnage premiums apply)

- Cranes in Luffer Configuration - A1 rate plus $ 5.00
- Cranes with external ballast (Tray or Wagon) - A1 rate plus $ 5.00
- NOTE: These premiums are in addition to the tonnage premiums if over 400 tons.

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker	$ 34.30

OVERTIME PAY
See (B, E, *Q) on OVERTIME PAGE
*If a designated holiday is worked, employee shall receive 8 hours of straight time pay in addition to the double time rate for all hours worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: If a holiday falls on Sunday, it will be celebrated on Monday. If the holiday falls on Saturday, it will be celebrated on Friday.

REGISTERED APPRENTICES
Wages per hour

1000 hours terms at the following percentage of Journeyworker's wage Class B:

1st	2nd	3rd	4th
60%	70%	80%	90%

Supplemental Benefits per hour worked

All terms	$ 29.70

1-158 BCT

Operating Engineer - Heavy&Highway — 10/01/2026

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 1

ENTIRE COUNTIES
Albany, Broome, Chenango, Clinton, Columbia, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Montgomery, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Tioga, Warren, Washington

PARTIAL COUNTIES
Dutchess: Defined as north of the northern boundary line of City of Poughkeepsie then due east to Route 115 to Bedell Road then east along Bedell Road to VanWagner Road then north along VanWagner Road to Bower Road then east along Bower Road to Rte. 44 east to Route 343 then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to Connecticut.

WAGES
NOTE:
---In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.
---If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C.

CLASS A1**: All Cranes that require a NYS Crane License (Boom Truck, Cableway, Cherry Picker, Derrick, Dragline, Overhead Crane (Gantry or Straddle Type), Pile Driver, Tower Cranes (including self-erecting)***, Truck Crane).

CLASS A: Asphalt Curb Machine (self-propelled, slipform); Asphalt Paver; Automated Concrete Spreader (CMI type); Automatic Fine Grader; Backhoe (except tractor mounted, rubber tired); Backhoe Excavator, Full Swing (CAT 212 or similar type); Back Filling Machine; Belt Placer (CMI type); Blacktop Plant (automated); Blacktop Roller; Bull Dozer being operated with active GPS; Caisson Auger; Central Mix Concrete Plant (automated); Concrete Curb Machine (self-propelled, slipform); Concrete Pump; Cranes - listed in A1 that do not require a NYS Crane License; Directional Boring/Drilling Machine; Dredge; Dual Drum Paver; Excavator (all purpose-hydraulic, Gradall or similar); Front End Loader (4 cu. yd. & over); Head Tower (Sauerman or equal); Hoist (two or three drum); Holland Loader; Jetting Plow; Maintenance Engineer; Mine Hoist; Mucking Machine or Mole; Pavement Breaker (SP Wirtgen; PB-4 and similar type); Profiler/Milling Machine (over 105 h.p.); Power Grader; Quad 9; Quarry Master (or equivalent); Rotating Telehandler; Scraper (including challenger type); Shovel; Side Boom; Slip Form Paver; Tractor Drawn Belt-Type Loader; Truck or Trailer Mounted Log Chipper (self-feeder); Tug Operator (manned rented equipment excluded); Tunnel Shovel.

CLASS B: Backhoe (tractor mounted, rubber tired); Bituminous Recycler Machine; Bituminous Spreader and Mixer; Blacktop Plant (non-automated); Blast or Rotary Drill (truck or tractor mounted); Boring Machine; Bridge Deck Finishing Machine; Brokk; Cage Hoist; Central Mix Plant (non-automated) and All Concrete Batching Plants; Concrete Paver (over 16'); Crawler Drill (self-contained); Crusher; Diesel Power Unit; Drill Rigs (truck or tractor mounted); Front End Loader (under 4 cu. yd.); Greaseman - Lubrication Engineer; HiPressure Boiler (15 lbs & over); Hoist (one drum); Hydro-Axe; Kolman Plant Loader & similar type loaders (if employer requires another man to clean the screen or to maintain the equipment, they shall be an Oiler); Locomotive; Material Handling Knuckle Boom; Mini Excavators (under 18,000 lbs.); Mixer (for stabilized base, self-propelled); Monorail Machine; Profiler/Milling Machine (105 h.p. and under); Plant Engineer; Prentice Loader; Pug Mill; Pump Crete; Ready Mix Concrete Plant; Refrigeration Equipment (for soil stabilization); Road Widener; Roller (all above subgrade, See Class A for Blacktop Roller); Sea Mule; Self-contained ride-on Rock Drill (excluding Air-Track type drill); Skidder; Tractor with Dozer and/or Pusher; Trencher; Tugger Hoist; Vacuum Machine (mounted or towed); Vermeer Saws (ride-on, any size or type); Welder; Winch and Winch Cat; Work Boat Operator including L.C.M.'s.
NOTE: Effective 07/01/27 Prentice Loader will move to CLASS A.

CLASS C: "A" Frame Winch Hoist (On Truck); Aggregate Plant; Articulated Heavy Hauler; Asphalt or Concrete Grooving Machine (ride-on); Ballast Regulator (ride-on); Bituminous Heater (self-propelled); Boat (powered); Boiler (used in conjunction with production); Cement & Bin Operator; Compressors****; Concrete Pavement Spreader and Finisher; Concrete Paver or Mixer (16' & under); Concrete Saw (self-propelled); Conveyor; Deck Hand; Directional Boring/Drilling Machine Locator; Drill (Core); Drill (Well); Dust Collectors****; Electric Pump When Used in Conjunction with Well Point System; Farm Tractor with accessories; Fine Grade Machine; Fireman; Forklift; Form Tamper; Generators****; Grout Pump; Gunite Machine; Hammers (hydraulic self-propelled); Heaters****; Hydra-Spiker (ride-on); Hydraulic Pump (jacking system); Hydro-Blaster (water); Light Plants****; Mulching Machine; Oiler; Parapet Concrete or Pavement Grinder; Post Hole Digger (excluding hand-held); Post Driver; Power Broom (towed); Power Heaterman; Power Sweeper; Pumps****; Revinius Widener; Roller (subgrade & fill); Scarifier (ride-on); Shell Winder; Skid Steer Loader (Bobcat or similar) including all attachments; Span Saw (ride-on); Steam Cleaner; Tamper (ride-on); Tie Extractor (ride-on); Tie Handlers (ride-on); Tie Inserters (ride-on); Tie Spacers (ride-on); Tire Repair; Track Liner (ride-on); Tractor; Tractor (with towed accessories); Vacuum Machine (self-propelled); Vibratory Compactor; Vibro Tamp; Welding Machines****; Well Point.

****CLASS C NOTE: Considered Hands-Off (unmanned). Includes only operation and maintenance of the equipment.

Per hour:	07/01/2026	07/01/2027 Additional	07/01/2028 Additional	07/01/2029 Additional
CLASS A1**	$ 63.56	$ 4.29*	$ 4.42*	$ 4.56*
CLASS A	59.81	3.54*	3.67*	3.81*
CLASS B	58.90	3.54*	3.67*	3.81*
CLASS C	56.33	3.54*	3.67*	3.81*

* To be allocated at a later date.

(**) TONNAGE PREMIUMS:
All cranes up to 64 ton capacity - A1 rate
All cranes 65 ton to 110 ton capacity - A1 rate plus $ 1.50
All cranes 111 ton to 199 ton capacity- A1 rate plus $ 2.00
All cranes 200 ton to 399 ton capacity - A1 rate plus $ 3.00
All cranes 400 ton to 599 ton capacity - A1 rate plus $ 4.00
All cranes 600 ton to 799 ton capacity - A1 rate plus $ 5.00
All cranes 800 ton to 999 ton capacity - A1 rate plus $ 6.00
All cranes 1000 ton capacity and over - A1 rate plus $ 7.00

(***) Tower Cranes - A1 rate plus $ 3.00 (no tonnage premiums apply)

- Cranes in Luffer Configuration - A1 rate plus $ 5.00
- Cranes with external ballast (Tray or Wagon) - A1 rate plus $ 5.00

Additional $ 2.50 per hour for hazardous waste removal work on a State and/or Federally designated waste site which requires employees to wear Level C or above forms of personal protection.

SHIFT WORK
SINGLE IRREGULAR WORK SHIFT: Additional $ 2.50 per hour for all employees who work a single irregular work shift starting from 5:00 PM to 1:00 AM that is mandated by the Contracting Agency.

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker $ 34.60

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

NOTE: If a holiday falls on Sunday, it will be celebrated on Monday. If an employee works on this Monday, they shall be compensated at double time plus the holiday pay (triple time).

REGISTERED APPRENTICES
WAGES per hour: Hourly terms at the following percentage of Journeyworker's CLASS B wage.

0-1000 hrs	60%
1001-2000 hrs	70%
2001-3000 hrs	80%
3001-4100 hrs	90%

An additional $ 2.50 per hour is required when an apprentice performs hazardous waste removal work on a State and/or Federally designated waste site which requires employees to wear Level C or above forms of personal protection.

SUPPLEMENTAL BENEFITS per hour:

All Terms	$29.20

1-158H/H Alb

Operating Engineer - Survey Crew 10/01/2026

JOB DESCRIPTION Operating Engineer - Survey Crew **DISTRICT** 12

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Wyoming, Yates

PARTIAL COUNTIES
Dutchess: The northern portion of the county from the northern boundary line of the City of Poughkeepsie, north.

WAGES
These rates apply to Building, Tunnel, and Heavy Highway.

Per hour:
SURVEY CLASSIFICATIONS:
Party Chief - One who directs a survey party and/or works independently.
Surveyor - One who operates the surveying instruments for measurements.
Survey Assistant - One who assists the Party Chief or Surveyor.

	07/01/2026	07/01/2027 Additional	07/01/2028 Additional
Party Chief	$ 56.64	$ 5.50*	$ 5.50*
Surveyor	52.74	$ 4.50*	$ 4.50*
Surveyor Assistant	36.00	$ 3.50*	$ 3.50*

Additional $3.00/hr. for Tunnel Work.
Additional $2.50/hr. for EPA or DEC certified toxic or hazardous waste work.

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour worked:

Party Chief	$ 32.45
Surveyor	$ 32.45
Survey Assistant	$ 20.60

OVERTIME PAY
See (B, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES: 1000 hour terms based on percentage of Surveyor wage:

07/01/2026

0-1000	1001-2000	2001-3000
60%	70%	80%

SUPPLEMENTAL BENEFIT per hour worked:

All Terms: $ 22.65

12-158-545 D.H.H.

Operating Engineer - Survey Crew - Consulting Engineer — 10/01/2026

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT** 12

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Wyoming, Yates

PARTIAL COUNTIES
Dutchess: The northern portion of the county from the northern boundary line of the City of Poughkeepsie, north.

WAGES
These rates apply to feasibility and preliminary design surveying, line and grade surveying for inspection or supervision of construction when performed under a Consulting Engineer Agreement.

Per hour:
SURVEY CLASSIFICATIONS:
Party Chief - One who directs a survey party and/or works independently
Surveyor - One who operates the surveying instruments for measurements
Survey Assistant - One who assists the Party Chief or Surveyor.

	07/01/2026	07/01/2027 Additional	07/01/2028 Additional
Party Chief	$ 56.64	$ 5.50*	$ 5.50*
Surveyor	52.74	$ 4.50*	$ 4.50*
Survey Assistant	36.00	$ 3.50*	$ 3.50*

Additional $3.00/hr. for Tunnel Work.
Additional $2.50/hr. for EPA or DEC certified toxic or hazardous waste work.

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour worked:

Party Chief	$ 32.45
Surveyor	$ 32.45
Survey Assistant	$ 20.60

OVERTIME PAY
See (B, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES: 1000 hour terms based on percentage of Surveyor wage:

07/01/2026

0-1000	1001-2000	2001-3000
60%	70%	80%

SUPPLEMENTAL BENEFIT per hour worked:
All Terms: $22.65

12-158-545 DCE

Operating Engineer - Tunnel — 10/01/2026

JOB DESCRIPTION Operating Engineer - Tunnel **DISTRICT** 7

ENTIRE COUNTIES
Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES
Dutchess: Northern part of Dutchess, to the northern boundary line of the City of Poughkeepsie, then due east to Route 115 to Bedell Road, then east along Bedell Road to VanWagner Road, then north along VanWagner Road to Bower Road, then east along Bower Road to Rte. 44 east to Rte. 343, then along Rte. 343 east to the northern boundary of the Town of Dover Plains and east along the northern boundary of the Town of Dover Plains, to the borderline of the State of Connecticut.

Genesee: Only that portion of the county that lies east of a line drawn down the center of Route 98 and the entirety of the City of Batavia.

WAGES

CLASS A: Automatic Concrete Spreader (CMI Type); Automatic Fine Grader; Backhoe (except tractor mounted, rubber tired); Belt Placer (CMI Type); Blacktop Plant (automated); Cableway; Caisson Auger; Central Mix Concrete Plant (automated); Concrete Curb Machine (self-propelled slipform); Concrete Pump (8" or over); Dredge; Dual Drum Paver; Excavator; Front End Loader (4 cu. yd & over); Gradall; Head Tower (Sauerman or Equal); Hoist (shaft); Hoist (two or three Drum); Log Chipper/Loader (self-feeder); Maintenance Engineer (shaft and tunnel); any Mechanical Shaft Drill; Mine Hoist; Mining Machine(Mole and similar types); Mucking Machine or Mole; Overhead Crane (Gantry or Straddle Type); Pile Driver; Power Grader; Remote Controlled Mole or Tunnel Machine; Scraper; Shovel; Side Boom; Slip Form Paver (If a second man is needed, they shall be an Oiler); Tripper/Maintenance Engineer (shaft & tunnel); Tractor Drawn Belt-Type Loader; Tug Operator (manned rented equipment excluded); Tunnel Shovel.

CLASS B: Automated Central Mix Concrete Plant; Backhoe (track mounted, rubber tired); Backhoe (topside); Bituminous Spreader and Mixer, Blacktop Plant (non-automated); Blast or Rotary Drill (truck or tractor mounted); Boring Machine; Cage Hoist; Central Mix Plant(non-automated); all Concrete Batching Plants; Compressors (4 or less exceeding 2,000 c.f.m. combined capacity); Concrete Pump; Crusher; Diesel Power Unit; Drill Rigs (tractor mounted); Front End Loader (under 4 cu. yd.); Grayco Epoxy Machine; Hoist (One Drum); Hoist (2 or 3 drum topside); Knuckle Boom material handler; Kolman Plant Loader & similar type Loaders (if employer requires another person to clean the screen or to maintain the equipment, they shall be an Oiler); L.C.M. Work Boat Operator; Locomotive; Maintenance Engineer (topside); Maintenance Grease Man; Mixer (for stabilized base-self-propelled); Monorail Machine; Plant Engineer; Personnel Hoist; Pump Crete; Ready Mix Concrete Plant; Refrigeration Equipment (for soil stabilization); Road Widener; Roller (all above sub-grade); Sea Mule; Shotcrete Machine; Shovel (topside); Tractor with Dozer and/or Pusher; Trencher; Tugger Hoist; Tunnel Locomotive; Vacuum Machine (mounted or towed); Welder; Winch; Winch Cat.

CLASS C: A Frame Truck; All Terrain Telescoping Material Handler; Ballast Regulator (ride-on); Compressors (4 not to exceed 2,000 c.f.m. combined capacity; or 3 or less with more than 1200 c.f.m. but not to exceed 2,000 c.f.m.); Compressors (any size, but subject to other provisions for compressors); Dust Collectors; Generators; Pumps; Welding Machines; Light Plants (4 or any type combination); Concrete Pavement Spreaders and Finishers; Conveyor; Drill (core); Drill (well); Electric Pump used in conjunction with Well Point System; Farm Tractor with Accessories; Fine Grade Machine; Fork Lift; Grout Pump (over 5 cu. ft.); Gunite Machine; Hammers (hydraulic-self-propelled); Hydra-Spiker (ride-on); Hydra-Blaster (water); Hydro-Blaster; Motorized Form Carrier; Post Hole Digger and Post Driver; Power Sweeper; Roller grade & fill); Scarifier (ride-on); Span-Saw (ride-on); Submersible Electric Pump (when used in lieu of well points); Tamper (ride-on); Tie-Extractor (ride-on), Tie Handler (ride-on), Tie Inserter (ride-on), Tie Spacer (ride-on); Track Liner (ride-on); Tractor with towed accessories; Vibratory Compactor; Vibro Tamp, Well Point.

CLASS D: Aggregate Plant; Cement & Bin Operator; Compressors (3 or less not to exceed 1,200 c.f.m. combined capacity); Compressors (any size, but subject to other provisions for compressors); Dust Collectors; Generators; Pumps; Welding Machines; Light Plants (3 or less or any type or combination); Concrete Saw (self-propelled); Form Tamper; Greaseman; Hydraulic Pump (jacking system); Junior Engineer; Light Plants; Mulching Machine; Oiler; Parapet Concrete or Pavement Grinder; Power Broom (towed); Power Heaterman (when used for production); Revinius Widener; Shell Winder; Steam Cleaner; Tractor.

Per hour:	07/01/2026	07/01/2027 Additional	07/01/2028 Additional	07/01/2029 Additional
CLASS A	$ 60.95	$ 3.54*	$ 3.67*	$ 3.81*
CLASS B	59.73	3.54*	3.67*	3.81*
CLASS C	56.94	3.54*	3.67*	3.81*
CLASS D	53.93	3.54*	3.67*	3.81*

* To be allocated at a later date.

Additional $5.00 per hour for Hazardous Waste Work on a state or federally designated hazardous waste site where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection.

CRANES:
Crane 1: All Tower cranes, including self-erecting.
Crane 2: All Lattice Boom Cranes and all other cranes with a manufacturer's rating of fifty (50) ton and over.
Crane 3: All hydraulic cranes and derricks with a manufacturer's rating of forty nine (49) ton and below, including boom trucks.

Crane 1	$ 64.95
Crane 2	63.95
Crane 3	62.95

SUPPLEMENTAL BENEFITS

Per hour:

$ 26.05
+ 10.85*

* This portion of the benefits subject to SAME PREMIUM as shown for overtime wages.

OVERTIME PAY

See (B, B2, E, Q, X) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: If a holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES
WAGES per hour: Hourly terms at the following percentage of Journeyworker's CLASS B wage.

1st term: (0-1000 hrs) 60%
2nd term: (1001-2000 hrs) 65%
3rd term: (2001-3000 hrs) 70%
4th term: (3001-4100 hrs) 75%

Additional $5.00 per hour for Hazardous Waste Work on a state or federally designated hazardous waste site where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection.

SUPPLEMENTAL BENEFITS per hour: Same as Journeyworker.

7-158-832TL.

Painter 10/01/2026

JOB DESCRIPTION Painter **DISTRICT** 2

ENTIRE COUNTIES
Broome, Chenango, Tioga

WAGES
Per hour:

	07/01/2026
Painter	$ 29.12
Taper, Paperhangers, and Vinyl hangers	30.58

ADDITIONAL AMOUNTS FOR SPECIFIC TYPES OF JOBSITE CONDITIONS (amount subject to any overtime premiums):
- Additional $ 1.10 per hour for Brush and Roll Epoxy (Solvent Base Only)
- Additional $ 0.60 per hour for Swing Scaffold, Boatswain chair, Spray helper, Steam cleaning acid and high pressure water, Power grinders with respirator
- Additional $ 0.60 per hour for Structural steel (buildings) defined as new or old construction where ceilings, walls or the steel itself is to be painted from open trusses which require climbing or crawling without the support of solid scaffolding or scaffolding starting at the floor or ground level.
- Additional $ 1.00 per hour for Spray Painting
- Additional $ 1.00 per hour for Steeple Jack (Over 100 feet)
- Additional $ 1.50 per hour for Spray Epoxy (Solvent Based)
- Additional $ 0.90 per hour for Sandblasting

NOTE - SEE BRIDGE PAINTER RATES FOR BRIDGES & TANKS

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker $ 25.91

OVERTIME PAY
See (B, E2, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
A Holiday that falls on a Sunday will be celebrated on Monday, a holiday that falls on a Saturday will be celebrated on Friday.

REGISTERED APPRENTICES
WAGES:

Painter: 750 hour terms at the Painter Apprentice wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 18.00	$ 19.00	$ 20.00	$ 21.00	$ 22.00	$ 23.00	$ 24.00	$ 25.00

Taper: 750 hour terms at the following Journeyworker Taper Apprentice wage rate:

1st	2nd	3rd	4th	5th	6th
$ 20.00	$ 21.00	$ 22.00	$ 23.00	$ 24.00	$ 25.00

ADDITIONAL AMOUNTS FOR SPECIFIC TYPES OF JOBSITE CONDITIONS (amount subject to any overtime premiums):
- Additional $ 1.10 per hour for Brush and Roll Epoxy (Solvent Base Only)
- Additional $ 0.60 per hour for Swing Scaffold, Boatswain chair, Spray helper, Steam cleaning acid and high pressure water, Power grinders with respirator
- Additional $ 0.60 per hour for Structural steel (buildings) defined as new or old construction where ceilings, walls or the steel itself is to be painted from open trusses which require climbing or crawling without the support of solid scaffolding or scaffolding starting at the floor or ground level.
- Additional $ 1.00 per hour for Spray Painting
- Additional $ 1.00 per hour for Steeple Jack (Over 100 feet)
- Additional $ 1.50 per hour for Spray Epoxy (Solvent Based)
- Additional $ 0.90 per hour for Sandblasting

SUPPLEMENTAL BENEFITS per hour:
Painter/Decorator:

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 6.00	$ 7.00	$ 8.00	$ 9.10	$ 11.00	$ 11.00	$ 13.00	$ 14.00

Taper/Drywall Finisher:

1st	2nd	3rd	4th	5th	6th
$ 6.00	$ 7.00	$ 8.00	$ 10.00	$ 13.00	$ 14.00

2-178 B

Painter 10/01/2026

JOB DESCRIPTION Painter **DISTRICT** 3

ENTIRE COUNTIES
Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Cortland, Delaware, Erie, Genesee, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Wayne, Wyoming, Yates

WAGES
Per hour: 07/01/2026

Bridge	$ 47.39
Tunnel	47.39
Tank*	45.39

For Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

*Tank rate applies to indoor and outdoor tanks, tank towers, standpipes, digesters, waste water treatment tanks, chlorinator tanks, etc. Covers all types of tanks including but not limited to steel tanks, concrete tanks, fiberglass tanks, etc.

SHIFT WORK
Note an additional $1.50 per hour is required when the contracting agency or project specification requires any shift to start prior to 6:00am or after 12:00 noon.

SUPPLEMENTAL BENEFITS
Per hour:
$ 32.81

OVERTIME PAY
Exterior work only See (B, E2, E4, F, R) on OVERTIME PAGE.
All other work See (B, F, R) on OVERTIME PAGE.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:

750 hour terms at the following wage:

1st	2nd	3rd	4th	5th	6th
$ 24.00	$ 26.00	$ 28.00	$ 30.00	$ 34.00	$ 38.00

Supplemental benefits per hour:

1st	2nd	3rd	4th	5th	6th
$ 6.60	$ 6.95	$ 7.30	$ 7.65	$ 8.00	$ 8.35

3-4-Bridge, Tunnel, Tank

Painter - Metal Polisher — 10/01/2026

JOB DESCRIPTION Painter - Metal Polisher **DISTRICT** 8

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2026
Metal Polisher	$ 41.33
Metal Polisher*	42.43
Metal Polisher**	45.33

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker:
All classifications $ 13.99

OVERTIME PAY
See (B, E, P, T) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year term at the following wage rates:

	07/01/2026
1st year	$ 20.67
2nd year	22.73
3rd year	24.80
1st year*	$ 21.06
2nd year*	23.17
3rd year*	25.34
1st year**	$ 23.17
2nd year**	25.23
3rd year**	27.30

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
Per hour:

1st year	$ 9.19
2nd year	9.19
3rd year	9.19

8-8A/28A-MP

Plumber — 10/01/2026

JOB DESCRIPTION Plumber **DISTRICT** 2

ENTIRE COUNTIES
Broome, Chenango

PARTIAL COUNTIES
Cortland: Only the Township of Marathon.
Delaware: Only the Townships of Andes, Bovina, Colchester, Davenport, Delhi, Deposit, Franklin, Hamden, Hancock, Harpersfield, Kortright, Masonville, Meredith, Sidney, Stamford, Tompkins and Walton.
Madison: Only the Township of Georgetown.

Otsego: Only the Townships of Burlington, Butternuts, Decatur, Edmeston, Hartwick, Laurens, Maryland, Milford, Morris, New Lisbon, Oneonta, Otego, Pittsfield, Unadilla, Westford and Worchester.
Tioga: Only the Townships of Newark Valley and Owego.

WAGES

Per hour:	07/01/2026
Plumber	$ 46.91
Steamfitter	46.91

SHIFT WORK
Agency-mandated shift operations:

1. Shift work shall start no earlier than 6AM Monday and will conclude no later than 9AM Saturday (overtime premiums applicable after 8 hours in a shift).

2. Single irregular shiftwork, less than 3 consecutive days will be paid at the rate of time and one-half of the regular hourly rate.

3. 3 consecutive work days or more:
First Shift - No Premium (Starting 6AM-9AM)
Second Shift - Regular hourly rate plus 12%
Third Shift - Regular hourly rate plus 18%

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 16.00
	+18.81*

*This portion of the benefit is subject to the SAME PREMIUM as shown for overtime on projects over $100 million in total construction costs (including engineering & architecture).

OVERTIME PAY
See (B, E, Q, *V) on OVERTIME PAGE
*portion of supplemental benefits subject to V code when project cost is over $100 million (including engineering & architecture).

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
When a Holiday falls on Sunday, it will be celebrated the following day. If the holiday falls on a Saturday, it will be observed that day unless so determined by the Federal Government to be celebrated on a different day.

REGISTERED APPRENTICES
WAGES: One year terms at the following percentage of Journeyworker's wage.

1st.	2nd.	3rd.	4th.	5th.
50%	55%	60%	70%	85%

SUPPLEMENTAL BENEFITS per hour:

1st term	$ 16.00
	+9.42*
All other terms	$ 16.00
	+14.81*

*This portion of the benefit is subject to the SAME PREMIUM as shown for overtime on projects over $100 million in total construction costs (including engineering & architecture).

2-112s-SF

Plumber 10/01/2026

JOB DESCRIPTION Plumber **DISTRICT** 6

ENTIRE COUNTIES
Chemung, Cortland, Onondaga, Schuyler, Tompkins

PARTIAL COUNTIES
Madison: Only the Townships of Sullivan, Cazenovia and DeRuyter.
Seneca: Only the Townships of Covert and Lodi.
Steuben: Only the Townships of Addison, Bath, Bradford, Campbell, Caton, Corning, Erwin, Hornby, Lindley, Pulteney, Rathbone, Thurston, Tuscarora, Urbana and Wayne.
Tioga: Only the Townships of Barton, Berkshire, Candor, Nichols, Richford, Spencer and Tioga.

WAGES

Per hour:	07/01/2026
Plumber, Steamfitter, Pipefitter, Welder, HVAC, Refrigeration.	$ 52.16

SHIFT WORK

SINGLE IRREGULAR WORK SHIFT: Additional 15% premium added to the wage rate above for a single irregular work shift starting between 4:30 PM and 7:00 AM.

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker	$ 28.75*

*NOTE: $ 15.27 of the supplemental benefits are paid at the same premium as shown for overtime work performed at semi-conductor manufacturer and/or fabrication plants.

OVERTIME PAY

Time and one half for the 9th & 10th hours Monday through Friday and first 10 hours on Saturday. All other overtime hours are double time.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6) on HOLIDAY PAGE

NOTE: If a holiday falls on Saturday, the holiday will be observed on the preceding Friday. If a holiday falls on Sunday, it will be observed on the following Monday.

REGISTERED APPRENTICES

WAGES per hour: One year terms at the following percentage of the Journeyworker's wage:

1st	2nd	3rd	4th	5th
55%	60%	70%	75%	85%

SUPPLEMENTAL BENEFITS per hour*:

1st	$ 16.20
2nd	25.03
3rd	25.72
4th	26.34
5th	27.41

*NOTE: Below is the portion of supplemental benefits paid at overtime premiums for work performed at semi-conductor manufacturer and/or fabrication plants:

1st	n/a
2nd	$ 8.58
3rd	8.77
4th	9.14
5th	9.71

6-81-SF

Roofer — 10/01/2026

JOB DESCRIPTION Roofer **DISTRICT** 2

ENTIRE COUNTIES

Broome, Chemung, Chenango, Delaware, Otsego, Schoharie, Schuyler, Steuben, Tioga, Tompkins

WAGES

Per hour:	07/01/2026	06/01/2027 Additional	06/01/2028 Additional
Roofer, Waterproofer	$ 31.79 + 1.06*	$ 3.50**	$ 4.00**

*This amount is paid for all hours worked, whether regular or premium hours.
**To be allocated at a later date.

NOTE ADDITIONAL PREMIUMS PAID FOR THE FOLLOWING WORK LISTED BELOW (amount not subject to overtime premiums):
- On days where more than one shift is worked on the job, the hours worked after 4:30 PM and before 6:00 AM will be paid an additional $1.90 per hour premium. This premium is not for use in emergency repair situations.

- Premium of $1.25 per hour will be paid for the application, rip-off, torching, or handling of pitch products. The premium will be paid for pitch that is showing, covered or buried on the roof.
- Premium of $1.25 per hour will be paid for asbestos abatement requiring a half face respirator.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 24.99

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages:
Indentured prior to 06/01/2026:

Hours per term	
0-667 Hrs.	$ 22.25 + 0.74*
668-1334 Hrs.	23.84 + 0.79*
1335-2001 Hrs.	25.43 + 0.85*
2002-2668 Hrs.	27.02 + 0.90*
2669-3335 Hrs.	28.61 + 0.95*
3336-4000 Hrs.	30.20 + 1.01*

Indentured on or after 06/01/2026:

Hours per term	
0-600 Hrs.	$ 25.43 + 0.85*
601-1200 Hrs.	26.23 + 0.87*
1201-1800 Hrs.	27.02 + 0.90*
1801-2400 Hrs.	27.82 + 0.93*
2401-3000 Hrs.	28.61 + 0.95*
3001-3600 Hrs.	29.41 + 0.98*
3601-4200 Hrs.	30.20 + 1.01*
4201-4800 Hrs.	31.00 + 1.03*

*This amount is paid for all hours worked, whether regular or premium hours.

NOTE ADDITIONAL PREMIUMS PAID FOR THE FOLLOWING WORK LISTED BELOW (amount not subject to overtime premiums):
- On days where more than one shift is worked on the job, the hours worked after 4:30 PM and before 6:30 AM will be paid an additional $1.90 per hour premium. This premium is not for use in emergency repair situations.
- Premium of $1.25 per hour will be paid for the application, rip-off, torching, or handling of pitch products. The premium will be paid for pitch that is showing, covered or buried on the roof.
- Premium of $1.25 per hour will be paid for asbestos abatement requiring a half face respirator.

Supplemental Benefits:
Indentured prior to 06/01/2026:

Hours per term	
0-667 Hrs.	$ 20.93
668-1334 Hrs.	21.60
1335-2001 Hrs.	22.29
2002-2668 Hrs.	22.96
2669-3335 Hrs.	23.63
3336-4000 Hrs.	24.32

Indentured on or after 06/01/2026:

Hours per term	
0-600 Hrs.	$ 11.45
601-1200 Hrs.	11.45
1201-1800 Hrs.	19.50
1801-2400 Hrs.	23.30
2401-3000 Hrs.	23.63
3001-3600 Hrs.	23.97
3601-4200 Hrs.	24.32
4201-4800 Hrs.	24.65

2-203elmi

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 2

ENTIRE COUNTIES
Allegany, Broome, Chemung, Delaware, Otsego, Schuyler, Steuben, Tioga, Tompkins

WAGES
Per hour:

	07/01/2026	05/01/2027 Additional
Sheetmetal Worker	$ 40.82 + 1.02*	$ 4.00**

NOTE: Ten cents ($0.10) per hour additional premium to be paid when working polyresin fiberglass.
*Amount is paid for every hour worked (amount not subject to overtime premium)
**To be allocated at a later date

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker: $ 25.33

OVERTIME PAY
See (*B1, Q) on OVERTIME PAGE
*On Saturday, time and one half of the hourly rate for the first ten (10) hours, then two (2) times the hourly wage rate for all hours after ten (10) hours worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: Holidays are observed on the Holiday, not on the day that it is locally observed.

REGISTERED APPRENTICES
WAGES per hour:
Indentured after 05/01/2025 (1-year Terms):

	1st	2nd	3rd	4th	5th
07/01/2026	$ 24.49 +0.61*	$ 26.53 +0.66*	$ 28.57 +0.71*	$ 32.66 +0.82*	$ 34.70 +0.87*

Indentured prior to 05/01/2025 (Half Year Terms):

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2026	$ 24.49 +0.61*	$ 24.49 +0.61*	$ 26.53 +0.66*	$ 28.57 +0.71*	$ 30.62 +0.77*	$ 32.66 +0.82*	$ 34.70 +0.87*	$ 36.74 +0.92*

*Amount is paid for every hour worked (amount not subject to overtime premium)

SUPPLEMENTAL BENEFITS per hour:
Indentured after 05/01/2025:

	1st	2nd	3rd	4th	5th
07/01/2026	$ 2.28	$ 21.05	$ 21.13	$ 21.30	$ 25.08

Indentured prior to 05/01/2025:

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2026	$ 2.28	$ 2.28	$ 21.05	$ 21.13	$ 21.22	$ 21.30	$ 21.38	$ 21.46

Sprinkler Fitter 10/01/2026

JOB DESCRIPTION Sprinkler Fitter **DISTRICT** 1

ENTIRE COUNTIES
Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Washington, Wayne, Wyoming, Yates

WAGES
Per hour

	07/01/2026	01/01/2027	04/01/2027	01/01/2028
Sprinkler Fitter	$ 47.91	$ 47.91	$ 50.76	$ 50.76

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker	$ 30.71	$ 31.71	$ 31.71	$ 32.71

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

REGISTERED APPRENTICES
One Half Year terms at the following wage per hour:

	07/01/2026	01/01/2027	04/01/2027	01/01/2028
1st Term	$ 24.50	$ 24.50	$ 25.73	$ 25.73
2nd Term	27.35	27.35	28.72	28.72
3rd Term	29.63	29.63	31.11	31.11
4th Term	31.91	31.91	33.50	33.50
5th Term	33.62	33.62	35.30	35.30
6th Term	36.47	36.47	38.29	38.29
7th Term	38.75	38.75	40.68	40.68
8th Term	41.03	41.03	43.08	43.08
9th Term	43.30	43.30	45.47	45.47
10th Term	45.58	45.58	47.86	47.86
Supplemental Benefits per hour:				
1st & 2nd Term	$ 10.23	$ 11.23	$ 11.23	$ 12.23
3rd & 4th Term	22.79	23.79	23.79	24.79
All Other Terms	23.04	24.04	24.04	25.04

1-669

Teamster - Building — 10/01/2026

JOB DESCRIPTION Teamster - Building **DISTRICT** 6

ENTIRE COUNTIES
Broome, Cayuga, Cortland, Delaware, Onondaga, Seneca, Tompkins, Yates

PARTIAL COUNTIES
Allegany: Only the Townships of Alfred, Almond, Burns.
Chenango: Only the Townships of Afton, Bainbridge, Coventry, Greene, Guilford, Oxford and Smithville.
Madison: Only the Townships of Cazenovia, DeRuyter, Fenner, Georgetown, Lenox, Nelson and Sullivan.
Oswego: All Townships except Boylston, Redfield and Sandy Creek.
Otsego: Only the Townships of Butternuts, Laurens, Maryland, Millford, Morris, Oneonta, Otego, Unadilla, and Worchester.
Steuben: Only the Townships of Canisteo, Cohoctan, Dansville, Fremont, Greenwood, Hornell, Hartsville, Jasper, Prattsburg, Troupsburg, and West Union.
Tioga: Only the Townships of Berkshire, Candor, Newark Valley, Nichols, Owego, Richford, and Tioga. All territory east of Nichols/Smithboro to Broome County, within the State of New York.

WAGES
GROUP A: Straight Trucks.
GROUP B: Tractor Trailer, Farm Tractor, Fuel Truck.
GROUP C: Euclid.
GROUP D: On site Mechanic.

Per hour:	07/01/2026	07/01/2027	07/01/2028
Building: (under $ 5 million*)			
GROUP A, B, C, D	$ 38.65	$ 42.31	$ 47.91
Building: (over $ 5 million*)			
GROUP A, B	$ 39.70	$ 43.36	$ 48.96
GROUP C	40.05	43.71	49.31
GROUP D	39.85	43.51	49.11

* Total project cost including General Construction, Plumbing, HVAC and Electrical

NOTE: All work performed at nuclear power plants, and fuel trucks that require a hazardous materials license, shall receive a $ 5.00 per hour premium above the applicable wage rate.

SUPPLEMENTAL BENEFITS
Per hour:

(under $ 5 million*)	$ 33.16	$ 35.51	$35.92
(over $ 5 million*)	33.96	36.31	36.73

* Total project cost including General Construction, Plumbing, HVAC and Electrical

OVERTIME PAY
(D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

6-317

Teamster - Building / Heavy&Highway 10/01/2026

JOB DESCRIPTION Teamster - Building / Heavy&Highway **DISTRICT** 7

ENTIRE COUNTIES
Chemung, Livingston, Monroe, Ontario, Schuyler, Wayne

PARTIAL COUNTIES
Genesee: Only in the townships of Oakfield, Elba, Batavia, Byron, Alexander, Bethany, Pavilion, Leroy, Stafford, and Bergen.
Orleans: Only in the townships of Gaines, Carlton, Barre, Kendall, Murray, Clarendon, and Albion.
Steuben: Only the Townships of: Addison, Avoca, Bath, Bradford, Cameron, Campbell, Caton, Corning, Erwin, Hornby, Howard, Lindley, Pulteney, Rathbone, Thurston, Tuscarora, Urbana, Wayland, Wayne, Wheeler, and Woodhull.
Tioga: Only from Nichols/Smithboro towards the City of Elmira (west).
Wyoming: Only in the townships of Attica, Orangeville, Wethersfield, Eagle, Genesee Falls, Castile, Gainesville, Perry, Warsaw, Middlebury, Covington, and Pike.

WAGES
NOTE - THIS RATE APPLIES ONLY TO MILLING OPERATIONS (ASPHALT or CONCRETE) WHEN MATERIALS ARE TO BE REMOVED FROM THE PROJECT SITE.

Per hour:	07/01/2026
Teamster - Mill Rate	$ 28.50

SUPPLEMENTAL BENEFITS
Per hour:

$ 13.17

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

7-118-Mill

Teamster - Building / Heavy&Highway 10/01/2026

JOB DESCRIPTION Teamster - Building / Heavy&Highway **DISTRICT** 7

ENTIRE COUNTIES
Chemung, Livingston, Monroe, Ontario, Schuyler, Wayne

PARTIAL COUNTIES
Genesee: Only in the townships of Oakfield, Elba, Batavia, Byron, Alexander, Bethany, Pavilion, Leroy, Stafford, and Bergen.
Orleans: Only in the townships of Gaines, Carlton, Barre, Kendall, Murray, Clarendon, and Albion.
Steuben: Only the Townships of: Addison, Avoca, Bath, Bradford, Cameron, Campbell, Caton, Corning, Erwin, Hornby, Howard, Lindley, Pulteney, Rathbone, Thurston, Tuscarora, Urbana, Wayland, Wayne, Wheeler, and Woodhull.
Tioga: Only from Nichols/Smithboro towards the City of Elmira (west).
Wyoming: Only in the townships of Attica, Orangeville, Wethersfield, Eagle, Genesee Falls, Castile, Gainesville, Perry, Warsaw, Middlebury, Covington, and Pike.

WAGES
GROUP #1: Warehousemen*, Yardmen*, Truck helpers, Pickups, Panel trucks, Flatboy material trucks (straight jobs), Single Axle dump trucks, Dumpsters, Material Checkers/Receivers*, Greasers, Tiremen, Mechanics Helpers/Parts Chasers.
GROUP #2: Tandems and Batch Trucks, Mechanics.
GROUP #3: Semi-trailers, Low-Boy trucks, Asphalt distributor trucks, and Agitator, Mixer trucks and Dumpcrete type vehicles, Truck mechanic, Fuel trucks.
GROUP #4: Articulated off-road material hauler, Specialized earth moving equipment, Euclid type, or similar off-highway equipment, where not self-loaded, Straddle (Ross) carrier, and self-contained concrete mobile truck.
GROUP #5: Off-highway Tandem back-dump, Twin engine equipment and double-hitched equipment where not self-loaded.

*NOTE - Applies when a temporary warehouse structure is built/utilized specifically for a public work project.

Per hour:	07/01/2026
GROUP #1	$ 33.59
GROUP #2	33.64
GROUP #3	33.69
GROUP #4	33.84
GROUP #5	33.99

Additional $1.50 per hour for hazardous waste removal work on a City, County, State and/or Federal Designated waste site where regulations require employee to use or wear personal protection.

SUPPLEMENTAL BENEFITS
Per hour:

$ 27.94

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

7-118

Teamster - Heavy&Highway 10/01/2026

JOB DESCRIPTION Teamster - Heavy&Highway **DISTRICT** 2

ENTIRE COUNTIES
Broome, Delaware

PARTIAL COUNTIES
Chenango: Only the Townships of Smithville, Greene, Coventry, Oxford, Afton, Bainbridge and Guilford.
Otsego: Only the Townships of Butternuts, Laurens, Maryland, Milford, Morris, Oneonta, Otego, Unadilla and Worchester.
Tioga: Only the Townships of Nichols, Tioga, Candor, Richford, Berkshire, Newark Valley and Owego.

WAGES
Per hour:

GROUP #1: Warehousemen, Yardmen, Truck Helpers, Pickups, Panel Trucks, Flatboy Material Trucks (straight jobs), Single Axle Dump Trucks, Dumpsters, Material Checkers and Receivers, Greasers, Truck Tiremen, Mechanic Helpers and Parts Chasers, Tandems and Batch Trucks, Mechanics, Dispatcher. Semi-Trailers, Low-boy Trucks, Asphalt Distributor Trucks, Agitator, Mixer Trucks and Dumpcrete type vehicles, Truck Mechanic.

GROUP #2: Specialized Earth Moving Equipment-Euclid type or similar off-highway where not self-loading. Straddle (Ross) Carrier, and self-contained concrete mobile truck. Off-highway Tandem Back-Dump, Twin Engine Equipment and Double-Hitched Equipment where not self-loading.

GROUP #3: Fuel Truck that requires a HazMat license endorsement.

	07/01/2026	07/01/2027
Group #1	$ 39.98	$ 43.64
Group #2	40.07	43.73
Group #3	44.98	48.64

NOTES
- An additional $1.50 per hour shall be paid to an employee who performs hazardous waste removal work on a City, County, State and/or Federally designated waste site where employee is required to use or wear personal protective equipment.

SHIFT WORK
- A single irregular work shift can start any time between 5:00pm and 1:00am. All employees who work a single irregular shift on governmental mandated night work shall be paid an additional $5.00 per hour (applicable on projects bid on or after 07/01/2020).

SUPPLEMENTAL BENEFITS
Per hour paid:

	$ 28.85	$ 29.69

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE
If a holiday falls on Sunday, it will be celebrated Monday.
Any employee laid off within the week in which a holiday falls shall receive holiday pay.

2-317(Bing)

Welder 10/01/2026

JOB DESCRIPTION Welder **DISTRICT** 1

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES
Per hour 07/01/2026

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY

HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

(AA)	Time and one half of the hourly rate after 7 and one half hours per day
(A)	Time and one half of the hourly rate after 7 hours per day
(B)	Time and one half of the hourly rate after 8 hours per day
(B1)	Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday. Double the hourly rate for all additional hours
(B2)	Time and one half of the hourly rate after 40 hours per week
(B3)	Time and one half of the hourly rate after 40 straight hours per week
(C)	Double the hourly rate after 7 hours per day
(C1)	Double the hourly rate after 7 and one half hours per day
(D)	Double the hourly rate after 8 hours per day
(D1)	Double the hourly rate after 9 hours per day
(E)	Time and one half of the hourly rate on Saturday
(E1)	Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
(E2)	Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E3)	Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
(E4)	Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E5)	Double time after 8 hours on Saturdays
(F)	Time and one half of the hourly rate on Saturday and Sunday
(G)	Time and one half of the hourly rate on Saturday and Holidays
(H)	Time and one half of the hourly rate on Saturday, Sunday, and Holidays
(I)	Time and one half of the hourly rate on Sunday
(J)	Time and one half of the hourly rate on Sunday and Holidays
(K)	Time and one half of the hourly rate on Holidays
(L)	Double the hourly rate on Saturday
(M)	Double the hourly rate on Saturday and Sunday
(N)	Double the hourly rate on Saturday and Holidays
(O)	Double the hourly rate on Saturday, Sunday, and Holidays
(P)	Double the hourly rate on Sunday
(Q)	Double the hourly rate on Sunday and Holidays
(R)	Double the hourly rate on Holidays

(S)	Two and one half times the hourly rate for Holidays
(S1)	Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
(T)	Triple the hourly rate for Holidays
(U)	Four times the hourly rate for Holidays
(V)	Including benefits at SAME PREMIUM as shown for overtime
(W)	Time and one half for benefits on all overtime hours.
(X)	Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

(1)	None
(2)	Labor Day
(3)	Memorial Day and Labor Day
(4)	Memorial Day and July 4th
(5)	Memorial Day, July 4th, and Labor Day
(6)	New Year's, Thanksgiving, and Christmas
(7)	Lincoln's Birthday, Washington's Birthday, and Veterans Day
(8)	Good Friday
(9)	Lincoln's Birthday
(10)	Washington's Birthday
(11)	Columbus Day
(12)	Election Day
(13)	Presidential Election Day
(14)	1/2 Day on Presidential Election Day
(15)	Veterans Day
(16)	Day after Thanksgiving
(17)	July 4th
(18)	1/2 Day before Christmas
(19)	1/2 Day before New Years
(20)	Thanksgiving
(21)	New Year's Day
(22)	Christmas
(23)	Day before Christmas
(24)	Day before New Year's
(25)	Presidents' Day
(26)	Martin Luther King, Jr. Day
(27)	Memorial Day
(28)	Easter Sunday

(29) Juneteenth

New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12226

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By: (Check Only One) ☐ Contracting Agency ☐ Architect or Engineering Firm ☐ Public Work District Office Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address ☐ (Check if new or change)

Telephone Fax

E-Mail:

2. NY State Units (see Item 5).

- ☐ 01 DOT
- ☐ 02 OGS
- ☐ 03 Dormitory Authority
- ☐ 04 State University Construction Fund
- ☐ 05 Mental Hygiene Facilities Corp.
- ☐ 06 OTHER N.Y. STATE UNIT
- ☐ 07 City
- ☐ 08 Local School District
- ☐ 09 Special Local District, i.e., Fire, Sewer, Water District
- ☐ 1O Village
- ☐ 11 Town
- ☐ 12 County
- ☐ 13 Other Non-N.Y. State (Describe)

3. SEND REPLY TO ☐ (check if new or change)
Name and complete address:

Telephone Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

☐ New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

☐ Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

- ☐ 1. New Building
- ☐ 2. Addition to Existing Structure
- ☐ 3. Heavy and Highway Construction (New and Repair)
- ☐ 4. New Sewer or Waterline
- ☐ 5. Other New Construction (Explain)
- ☐ 6. Other Reconstruction, Maintenance, Repair or Alteration
- ☐ 7. Demolition
- ☐ 8. Building Service Contract

8. OCCUPATION FOR PROJECT :

- ☐ Construction (Building, Heavy Highway/Sewer/Water)
- ☐ Tunnel
- ☐ Residential
- ☐ Landscape Maintenance
- ☐ Elevator maintenance
- ☐ Exterminators, Fumigators
- ☐ Fire Safety Director, NYC Only
- ☐ Fuel Delivery
- ☐ Guards, Watchmen
- ☐ Janitors, Porters, Cleaners, Elevator Operators
- ☐ Moving furniture and equipment
- ☐ Trash and refuse removal
- ☐ Window cleaners
- ☐ Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES ☐ NO ☐

10. Name and Title of Requester

Signature

SEE PAGE TWO FOR LAWS RELATING TO PUBLIC WORK CONTRACTS

NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED ANY PUBLIC WORK CONTRACT

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: https://apps.labor.ny.gov/EDList/searchPage.do

For inquiries please call 518-457-5589.

NYSDOL Bureau of Public Work Debarment List 10/02/2026

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5784	A.J.M. TRUCKING, INC.		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL		AKHLAQ OULAKH		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		ALEXANDER DELISA		411 THEODORE FREMND SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	NYC		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL	*****8387	AMERICAN PAVING & MASONRY, CORP.		8 FOREST AVE GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL	*****8654	AMERICAN PAVING, INC.		8 FORREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	NYC	*****8017	AMIN ELECTRICAL CORP.		97-23 218TH STREET QUEENS VILLAGE NY 11429	12/04/2025	12/04/2030
DOL	DOL		ANGELO STANCO		8 FOREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL		ANTHONY CASALE		20 HEATHER RIDGE ROAD TROY NY 12180	05/20/2025	05/20/2030
DOL	DOL		ANTHONY MONGELLI		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	DOL	*****3932	B ROC CONSTRUCTION INC		7307 WOODSIDE ROAD VICTOR NY 14564	05/06/2025	05/06/2030
DOL	DA	*****2404	BJA RENOVATION, CORP		33 DOLLARD DR NORTH BABYLON NY 11703	03/19/2025	03/19/2030
DOL	DOL	*****5078	BLACK RIVER TREE REMOVAL, LLC		29807 ANDREWS ROAD BLACK RIVER NY 13032	10/17/2023	10/17/2028
DOL	DOL		C.M.C CONTRACTORS, INC.		500 WEST PUTNAM AVE SUITE 400GREENWICH CT 06830	09/03/2025	09/03/2030
DOL	DOL		CARLOS F. ESCOBAR		411 THEODORE FREMD AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		CARLOS FIGUEROA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		CESAREO TULA		120 SEARS AVE ELMSFORD NY 10523	09/26/2025	09/26/2030
DOL	DOL	*****2292	CHAMPION MAINTENANCE CONTRACTORS, INC.		211 SOUTH RIDGE STREET RYE BROOK NY 10573	09/03/2025	09/03/2030
DOL	NYC	*****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DOL		CHARLES CASALE		551 MAIN AVENUE WYNANTSKILL NY 12198	05/20/2025	05/20/2030
DOL	DOL		CHARLES CASALE		551 MAIN AVENUE WYNANTSKILL NY 12198	05/20/2025	05/20/2030
DOL	DOL		CHRISTOPHER PEROSI		5507 NESCONSET HIGHWAY MT. SINAI NY 11766	07/17/2025	07/17/2030
DOL	DOL	*****2281	CORRAO TRUCKING, INC.		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL DELISA		211 SOUTH RIDGE STREET RYE BROOK NY 10573	09/03/2025	09/03/2030
DOL	DOL		DANIEL LOHAN		6836 N. LEXINGTON LANE NILES IL 60714	05/28/2026	05/28/2031
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL		DARWIN PEGUESE		6400 BALTIMORE NATIONAL SUITE 602CANTONSVILLE NY 21228	10/24/2024	10/24/2029
DOL	DOL		DAVID FRIEDLANDER		64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		DENISE NAGLE		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030

NYSDOL Bureau of Public Work Debarment List 10/02/2026

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DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL	*****2337	EGL DRAINAGE SOLUTION & REPAIRS LLC		5507 NESCONSET HIGHWAY MT. SINAI NY 11766	07/17/2025	07/17/2030
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL		EMIL KISZKO		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION CORP.		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION LLC		4192 SIR ANDREW CIRCLE DOYLESTOWN PA 18902	07/18/2024	07/18/2029
DOL	NYC		ENRICO MANETTA		101 MALBA DR. WHITESTONE NY 11357	04/01/2026	04/01/2031
DOL	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DOL	*****2998	G.E.M. AMERICAN CONSTRUCTION CORP.		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	NYC		GHANSHYAM AMIN		97-23 218TH STREET QUEENS VILLAGE NY 11429	12/04/2025	12/04/2030
DOL	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		GIOVANNI NAPOLITANO		2501 BAYVIEW AVENUE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DA	*****0213	GORILLA CONTRACTING GROUP, LLC		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DA	*****4760	GTX CONSTRUCTION ASSOCIATES, CORP		2501 BAYVIEW AVE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DOL		HENRY WICKE A/K/A HENRY WICKE, JR.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****6961	HUNTER ELEVATOR COMPANY, INC.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL	*****2397	ISLAND BREEZE MARINE, INC.		6400 BALTIMORE NATIONAL CANTONSVILLE MD 21228	10/24/2024	10/24/2029
DOL	DOL	*****5010	J. LINDSLEY ENTERPRISE, LLC		1002 STATE ROUTE 176 FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL	*****0241	J. LINDSLEY ROOFING, LLC		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		J.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES LINDSLEY		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027

NYSDOL Bureau of Public Work Debarment List 10/02/2026

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DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	*****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JENNIFER LINDSLEY		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		JERRY DASTON		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN NAGLE A/K/A JOHN NAGLE, JR.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		JONATHAN DELISA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		JORGE FIGUEROA		411 THEODORE FRMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DA		JOSEPH DEMASCO		33 DOLLARD DRIVE NORTH BABYLON NY 11703	01/30/2026	01/30/2031
DOL	DA		JOSEPH DEMASCO		33 DOLLARD DRIVE NORTH BABYLON NY 11703	03/19/2025	03/19/2030
DOL	DOL		JOSEPH HALL		937 US ROUTE 11 CENTRAL SQUARE NY 13036	10/21/2024	10/21/2029
DOL	DOL	*****2271	JOSEPH HALL COMPANIES LLC		937 US ROUTE 11 CENTRAL SQUARE NY 13036	10/21/2024	10/21/2029
DOL	DOL		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		JRN CONSTRUCTION CO, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		KEVIN FUNEZ URBINA A/K/A KEVIN FUNEZ		1009 LYNDALE AVE TRENTON NJ 08629	12/16/2024	12/16/2029
DOL	DOL	*****8760	KJ&J CONSTRUCTION, LLC		1009 LYNDALE AVE TRENTON NJ 08629	12/16/2024	12/16/2029

DOL	DOL		KMA GROUP II, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL	*****1833	KMA GROUP INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KMA INSULATION, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KRIN HEINEMANN		2345 ROUTE 52, SUITE 2N HOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	NYC		KULWANT S. DEOL		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****3716	LIGHTNIN ELECTRIC INC.		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029
DOL	AG	*****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DOL		LIZETTE PONCE		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	NYC	*****7516	MANCO ENTERPRISES OF NY, INC.		44-17 54TH DR. MASPETH NY 11378	04/01/2026	04/01/2031
DOL	NYC	*****1783	MANETTA ENTERPISES, INC. D/B/A MANETTA INDUSTRIES		44-17 54TH DR. MASPETH NY 11378	04/01/2026	04/01/2031
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		MOHAMMAD MIAN		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	NYC		NASEER CHAUDHRY		2349 BRAGG STREET BROOKLYN NY 11229	04/22/2025	04/22/2030
DOL	DOL	*****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****1797	NATIONAL CONSTRUCTION SERVICES, INC		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		NELCO CONTRACTING, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DA		NICHOLAS BARNETT		33 DOLLARD DR BABYLON NY 11703	03/04/2025	03/04/2030
DOL	DOL		NICHOLAS RAO		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DA		NICHOLAS T. ANALITIS		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		NIKOLA NTONI		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029
DOL	NYC	*****6971	NN CONSTRUCTION, INC.		2349 BRAGG STREET BROOKLYN NY 11229	04/22/2025	04/22/2030
DOL	NYC	*****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028

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DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL	*****2041	QUALITY STEEL ERECTORS INC.		6836 N. LEXINGTON LANE NILES IL 60714	05/28/2026	05/28/2031
DOL	DOL	*****4772	R.W. LOBDELL CONSTRUCTION LLC		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DOL		ROBBYE BISSESAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL		ROSA GARCIA		411 THEODORE FRMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DA	*****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		SILVANO TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	NYC	*****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	*****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL		STEVEN DELISA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED MUHAMMAD S. JAFRI A/K/A SHARRUKH JAFRI		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4855	TECH INDUSTRIES LLC		20 HEATHER RIDGE ROAD TROY NY 12180	05/20/2025	05/20/2030
DOL	DOL	*****2426	THE MATRUKH GROUP, INC.		4307 28TH AVE PO BOX 9082ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		THOMAS LOBDELL		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL		TIMOTHY PERCY		29807 ANDREWS ROAD BLACK RIVER NY 13612	10/17/2023	10/17/2028
DOL	DA	*****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DOL	*****8485	TULA PLUMBING AND HEATING LLC		120 SEARS AVE ELMSFORD NY 10523	09/26/2025	09/26/2030
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL		VINCENT CORRAO		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		WILLIAM A BELL		7307 WOODSIDE ROAD VICTOR NY 14564	05/06/2025	05/06/2030
DOL	DOL	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL	*****9494	WND CONSTRUCTION LLC		411 THEODORE FREMD AVENUE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

SECTION 01 08 00 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.
B. Owner's Project Requirements and Basis-of-Design documentation are included by reference for information only.

1.2 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning.
2. Commissioning meetings.
3. Commissioning reports.
4. Test equipment, instrumentation, and tools (including, but not limited to, proprietary test equipment, instrumentation, and tools) required to perform tests.
5. Use of test equipment, instrumentation, and tools for commissioning.
6. Construction checklist requirements, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
7. Commissioning tests and commissioning test demonstration.
8. Adjusting, verifying, and documenting identified systems and assemblies.
9. Work to correct commissioning issues.
10. Work to repeat tests when equipment and systems fail acceptance criteria.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submittal procedures requirements for commissioning.

2. Section 01 77 00 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.

3. Section 01 78 23 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal.

4. Section 23 08 00 "Commissioning of HVAC" for technical commissioning requirements for HVAC systems.

5. Section 26 08 00 "Commissioning of Electrical" for technical commissioning requirements for Electrical systems.

6. Individual Technical Specifications and Drawings: Equipment and systems design and installation, startup, field quality-control testing, and additional requirements indicated in the Contract Documents.

1.3 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.

B. Basis-of-Design Document: A document prepared by Owner, Architect, or Commissioning Authority that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.

C. Commissioning Authority: An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.

D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation requirements of commissioning.

E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of commissioning is defined in Section 011200 "Multiple Contract Summary."

F. Construction Phase Commissioning Completion: The stage of completion and acceptance of commissioning when resolution of deficient conditions and issues discovered during commissioning and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date Construction Phase Commissioning Completion is achieved. See Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.

1. Commissioning is complete when the work specified in this Section and related Sections has been completed and accepted, including, but not limited to, the following:

    a. Completion of tests and acceptance of test results.
    b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
    c. Comply with requirements in Section 017900 "Demonstration and Training."
    d. Completion and acceptance of submittals and reports.

G. Owner's Project Requirements: A document written by Owner, Architect, or Commissioning Authority that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

H. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

I. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

J. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

K. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.4 COMPENSATION

A. Should Architect, Commissioning Authority, other Owner's witness, or Owner's staff perform additional services or incur additional expenses due to actions of Contractor listed below, compensate Owner for such additional services and expenses.

1. Failure to provide timely notice of commissioning activities schedule changes.
2. Failure to meet acceptance criteria for test demonstrations.

B. Contractor shall compensate Owner for such additional services and expenses at the rate of $175.00 per labor hour plus the current per mile rate for personnel travelling plus per diem allowances for meals and lodging according to current U.S. General Services Administration (GSA) Per Diem Rates.

1.5 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):

1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning.
2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning.
3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning.
4. Appointed team members shall have the authority to act on behalf of the entity they represent.

B. Members Appointed by Owner:

1. Commissioning Authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning.
2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning.
3. Architect / Engineer, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning.

1.6 SUBMITTALS

A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedures general requirements for commissioning.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors to the performance of the various commissioning requirements.

2. Schedule of commissioning activities, integrated with the construction schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for construction schedule general requirements for commissioning.

3. Contractor personnel and subcontractors to participate in each test.

4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning Coordinator Letter of Authority:

1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:

a. Make inspections required for commissioning.
b. Coordinate, schedule, and manage commissioning of Contractor, subcontractors, and suppliers.
c. Obtain documentation required for commissioning from Contractor, subcontractors, and suppliers.
d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.

D. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.

1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

E. Commissioning schedule.

F. Two-week look-ahead schedules.

G. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.

2. Brief description of intended use.

3. Calibration record showing the following:

a. Calibration agency, including name and contact information.
b. Last date of calibration.
c. Range of values for which calibration is valid.
d. Certification of accuracy.
e. N.I.S.T. traceability certification for calibration equipment.
f. Due date of the next calibration.

H. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

I. Test Reports:

1. Pre-Startup Report: Prior to start up of equipment or a system, submit signed, completed construction checklists.

2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.

3. Commissioning Issues Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.

4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.

5. Data Trend Logs: Submit data trend logs at the end of the trend log period.

6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit print-out of log of alarms that occurred since the last log was printed.

1.7 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction Phase Commissioning Completion, include the following:

a. Pre-startup reports.
b. Approved test procedures.
c. Test data forms, completed and signed.
d. Progress reports.
e. Commissioning issues report log.
f. Commissioning issues reports showing resolution of issues.
g. Correspondence or other documents related to resolution of issues.
h. Other reports required by commissioning.
i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction Phase Commissioning Completion.
j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction Phase Commissioning Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:

1. Certification of commissioning process expertise. The following certifications are acceptable upon receipt of information demonstrating that certification is current and in good standing. Owner reserves the right to accept or reject other certifications as evidence of qualification.

a. Certified Commissioning Professional, by Building Commissioning Association.
b. Certified Building Commissioning Professional, by Association of Energy Engineers.
c. Existing Building Commissioning Professional, by Association of Energy Engineers.
d. Commissioning Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.
e. Accredited Commissioning Process Authority Professional, by University of Wisconsin.
f. Accredited Commissioning Process Manager, by University of Wisconsin.
g. Accredited Green Commissioning Process Provider, by University of Wisconsin.

2. Absent one of the certifications above, provide documented experience on at least three projects of similar scope and complexity commissioning systems of similar complexity to those contained in these documents. Provide written references from the lead Commissioning Authority of each project attesting to applicant experience, responsibilities, and proven capabilities in regards to commissioning being equal to those required to gain one of the listed certifications. Each reference must be certified in accordance with the above requirements.

B. Calibration Agency Qualifications: Certified by The American Association of Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

1.9 COMMISSIONING AUTHORITY'S RESPONSIBILITIES

A. Commissioning Authority Responsibilities: Comply with requirements in Section 011200 "Summary of Multiple Contracts."

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning shall remain the property of Contractor unless otherwise indicated.

B. Test equipment and instrumentation required to perform commissioning shall comply with the following criteria:

1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.

2. Calibrated and certified.

a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags permanently affixed.

b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.

3. Maintain test equipment and instrumentation.

4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Record report on compact disk.
2. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.

2. Include major tabs for each Specification Section.

3. Include minor tabs for each test.

4. Within each minor tab, include the following:

a. Test specification.

b. Pre-startup reports.

c. Approved test procedures.

d. Test data forms, completed and signed.

e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

A. Construction checklists cannot modify or conflict with the Contract Documents.

B. Create construction checklists based on actual systems and equipment to be included in Project.

C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment, if applicable.

1. Services connection requirements, including configuration, size, location, and other pertinent characteristics.

2. Included optional features.

3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness and lack of damage.

D. Installation Checklists: must in general document that equipment and systems are installed and started in accordance with the contract document requirements. See attachment #1 for sample checklists for a small group of representative equipment. Develop checklists in similar format with line items required designed to insure proper installation by installers:

1. Location according to Drawings and approved Shop Drawings.

2. Configuration.

3. Compliance with manufacturers' written installation instructions.

4. Attachment to structure.

5. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.

6. Utility connections are of the correct characteristics, as applicable.

7. Correct labeling and identification.

E. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.

F. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, minimum.

G. Performance Tests:

1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

H. Deferred Construction Checklists: Obtain Owner approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist, before submitting request for Certificate of Construction Phase Commissioning Completion. When approved, deferred construction checklists may be completed after date of Construction Phase Commissioning Completion. Include the following in request for Certificate of Construction Phase Commissioning Completion:

1. Identify deferred construction checklists by number and title.
2. Provide a target schedule for completion of deferred construction checklists.
3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.

I. Delayed Construction Checklists: Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction Phase Commissioning Completion. When approved, delayed construction checklists may be completed after date of Construction Phase Commissioning Completion. Include the following in request for Certificate of Construction Phase Commissioning Completion:

1. Identify delayed construction checklist by construction checklist number and title.
2. Provide a target schedule for completion of delayed construction checklists.
3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.3 GENERAL EXECUTION REQUIREMENTS

A. Schedule and coordinate commissioning with the construction schedule.

B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

C. Perform test demonstrations for Owner's witness. Unless otherwise indicated in specific testing requirements, demonstrate tests for 100 percent of work to which the test applies.

D. Report test data and commissioning issue resolutions.

E. Schedule personnel to participate in and perform Commissioning-Process Work.

F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:

1. Operating the equipment and systems they install during tests.
2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

A. Management and Coordination: Manage, schedule, and coordinate commissioning, including, but not limited to, the following:

1. Coordinate with subcontractors on their commissioning responsibilities and activities.

2. Obtain, assemble, and submit commissioning documentation.

3. Attend periodic on-site commissioning meetings. Comply with requirements in Section 01 31 00 "Project Management and Coordination."

4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the construction schedule. Update schedule at specified intervals.

5. Review and comment on preliminary test procedures and data forms.

6. Report inconsistencies and issues in system operations.

7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.

8. Direct and coordinate test demonstrations.

9. Coordinate witnessing of test demonstrations by Owner's witness.

10. Coordinate and manage training. Be present during training sessions to direct video recording, present training and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."

11. Prepare and submit specified commissioning reports.

12. Track commissioning issues until resolution and retesting is successfully completed.

13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.

14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.

B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published commissioning schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress, completion, and results of commissioning.

C. Construction Checklists:

1. Complete construction checklists as Work is completed.

2. Distribute construction checklists to installers before they start work.

3. Installers:

   a. Verify installation using approved construction checklists as Work proceeds.
   b. Complete and sign construction checklists daily for work performed during the preceding day.

4. Provide Commissioning Authority access to construction checklists.

D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.

F. Test Procedures and Test Data Forms:

1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.

2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.

3. Completed test data forms are the official records of the results of tests.

4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual. Test procedures will in general be designed to demonstrate that operating characteristics conform to any or all required and / or approved performance characteristics.

5. Review preliminary test procedures and test data forms and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:

   a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.

   b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."

7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

G. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.

2. Perform and complete each step of the approved test procedures in the order listed.

3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.

4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.

5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent of components which are not typical of at least 10, and shall be 25% of components which are typical of at least 10, unless otherwise indicated in the individual test specification.

2. Notify Owner's witness at least seven days in advance of each test demonstration.

3. Perform and complete each step of the approved test procedures in the order listed.

4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.

5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.

6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.

    a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.

7. False load test requirements are specified in related sections.

    a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.

I. Deferred Tests:

1. Deferred Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction Phase Commissioning Completion as follows:

    a. Identify deferred tests by number and title.
    b. Provide a target schedule for completion of deferred tests.

2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least seven calendar days (minimum) in advance of tests.

3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction Phase Commissioning Completion. Include the following in the request for Certificate of Construction Phase Commissioning Completion:

    a. Identify delayed tests by test number and title.
    b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.

2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least seven calendar days (minimum) in advance of tests.

3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

K. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.

2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.

3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.

4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:

    a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
    b. Submit commissioning compliance issue report form within 24 hours of the test.
    c. Determine the cause of the failure.
    d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.

    a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.

    b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.

    c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.

    d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:

    a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
    b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
    c. Record the results of each step of the diagnostic procedure.
    d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
    e. Determine and record corrective measures.
    f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:

    a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.

    b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.

    a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.6 COMMISSIONING MEETINGS

A. Commissioning Authority will schedule and conduct commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."

3.7 SEQUENCING

A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:

a. Material checks.

b. Installation checks.

c. Start up, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.

d. Performance Tests:

1) Static tests, as appropriate.

2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.

3) Equipment and assembly performance tests.

4) System performance tests.

5) Intersystem performance tests.

2. Commissioning tests.

B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.

C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.8 SCHEDULING

A. Commence commissioning as early in the construction period as possible.

B. Commissioning Schedule: Integrate commissioning into Contractor's construction schedule. See Section 01 32 00 "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Contractor's construction schedule and short interval schedule submittals.

2. Schedule the start date and duration for the following commissioning activities:

a. Submittals.
b. Preliminary operation and maintenance manual submittals.
c. Installation checks.
d. Startup, where required.
e. Performance tests.
f. Performance test demonstrations.
g. Commissioning tests.
h. Commissioning test demonstrations.

3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.

4. Determine milestones and prerequisites for commissioning. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning.

2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.

3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.
2. Notify Architect of commissioning schedule changes at least two work days in advance for activities requiring the participation of Owner's witness.

3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:

   a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.

   b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.

   c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.

   d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.

   e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.

2. Test data reports include the following:

   a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.

   b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.

   c. Signatures of individuals performing and witnessing tests.

   d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issues Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

    a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.

    b. Action distribution list.

    c. Report date.

    d. Test number and description.

    e. Equipment identification and location.

    f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.

    g. Diagnostic procedure or plan to determine the cause (include in initial submittal).

    h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).

    i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.

    j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.

    k. Schedule for retesting.

4. Weekly progress reports include information for tests conducted since the preceding report and the following:

    a. Completed data forms.
    b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
    c. Activities scheduled but not conducted per schedule.
    d. Commissioning compliance issue report log.
    e. Schedule changes for remaining Commissioning-Process Work, if any.

5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

    a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.

    b. Attach to the data form printed trend log data collected during the test or test demonstration.

    c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."

    a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.10 CERTIFICATE OF CONSTRUCTION PHASE COMMISSIONING COMPLETION

A. When Contractor considers that construction phase commissioning, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning.

B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction phase commissioning or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether or not included on Contractor's list, which are not sufficiently complete as defined in "Construction Phase Commissioning Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction Phase Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction phase commissioning completion.

C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

D. When construction phase commissioning or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction Phase Commissioning that shall establish the date of completion of construction phase commissioning. Certificate of Construction Phase Commissioning Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 01 08 00

SECTION 01 12 00 - MULTIPLE CONTRACT PROJECT SUMMARY-PROJECT SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Construction schedule.
4. Requirements and assignments for each Contract.
5. Owner-furnished products.
6. Access to site.
7. Coordination with occupants.
8. Work restrictions.

B. Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.

C. Each Contractor is responsible to review all Drawings and Specifications for every contract to gain a complete understanding and knowledge of the entire Project, to determine how the work of each contract is to interface with every other contract.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, the condition at which roofing is insulated and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction; and all exterior joints are sealed.

1.4 PROJECT INFORMATION

A. Project Identification: Elm Street Elementary – Phase 2

1. Project Location: 145 Elm Street Waverly, New York 14892

B. Owner: Waverly Central School District

1. Address: 45 Lincoln Street Waverly, New York 14892

C. Architect: Tetra Tech Engineers, Architects & Landscape Architects, P.C., d/b/a Tetra Tech Architects & Engineers.

1. Address: Cornell Business & Technology Park, 10 Brown Road, Ithaca, New York 14850

D. Construction Manager: LeChase Construction Services, LLC.

1. Address: 11849 East Corning Road Corning, New York 14830

2. LeChase Construction Services, LLC. (the Construction Manager) has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and each Contractor, according to a separate contract between Owner and Construction Manager.

E. District Project Representative: Jeff Mastrantuono

1. Project Representative will provide assistance in administering the Contract for Construction between Owner and each Contractor, according to provisions of Division 01 Section "Project Management and Coordination".

F. Building Code in Effect for Project: New York State Uniform Fire Prevention and Building Code and the Energy Conservation Construction Code of New York State.

1. Comply with the following: Building standards of the New York State Education Department.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. Addition and Alterations to Elm Street Elementary School

B. Type of Contract:

1. Project will be constructed under coordinated, generally concurrent multiple contracts. Contracts for this Project include the following:

a. General Contract – includes sitework and abatement
b. Mechanical Contract
c. Electrical Contract
d. Plumbing Contract
e. Food Service Contract
f. DAY / BAS Contract (direct)
g. DAY/ Security Contract (direct)

C. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.6 CONSTRUCTION SCHEDULE

A. The Work shall be conducted in accordance with the following schedule:

1. General Contract:

a. Commencement of Construction (Off-Site Activities): Immediately following Contract Award

b. Commencement of Construction (On-Site Activities): November 30, 2026.

c. Submittals: Provide all submittals within 30 days after award of contract

d. Substantial Completion date: August 27, 2027.

2. Mechanical Contract:

a. Commencement of Construction (of offsite activities) Upon contract award

b. Commencement of Construction (On-Site Activities): November 30, 2026.

c. Submittals: Provide all submittals within 30 days after award of contract

1) Provide all the submittals called for in Project Manual Division 23 (EQUIPMENT) within 15 days after award of contract.

d. Substantial Completion date: August 27, 2027.

e. Key mechanical dates:

1) Preconstruction balance report and pre-balance ventilation code minimum verification milestones to be coordinated with the Owner's Representative at the pre-construction conference.

2) Final balance reports approval: August 27, 2027.

3. Electrical Contract:

a. Commencement of Construction (Off-Site Activities): Immediately following Contract Award

b. Commencement of Construction (On-Site Activities): November 30, 2026.

c. Submittals: Provide all submittals within 30 days after award of contract.

1) Provide all the critical Electrical submittals called for in Project Manual per Division 26 specifications no longer than 15 days after award of contract. These submittals should include but not be limited to: gear, transformers, circuit panels, light fixtures, back boxes, generators, and electrical components associated with the Kitchen work area.

d. Substantial Completion date: August 27, 2027.

4. Plumbing Contract:

a. Commencement of Construction (Off-Site Activities): Immediately following Contract Award

b. Commencement of Construction (On-Site Activities): November 30, 2026.

c. Submittals: Provide all submittals within 30 days after award of contract

d. Substantial Completion date: August 27, 2027.

5. Food Service Contract:

a. Commencement of Construction (Off-Site Activities): Immediately following Contract Award

b. Commencement of Construction (On-Site Activities): November 30, 2026.

c. Submittals: Provide all submittals within 15 days after award of contract

d. Substantial Completion date: August 27, 2027.

1.7 REQUIREMENTS FOR EACH CONTRACT

A. Included in Each Contract:

1. In addition to specific responsibilities indicated in this Section, each contract is responsible to provide the following for its own work:

a. Construction layout.
b. Sleeves.
c. Anchor bolts.
d. Hangers and supports for piping, equipment, and systems.
e. Equipment pads.
f. Cutting and patching associated with the PRIME contractor's work.
g. Through-penetration firestopping associated with each of the PRIME contractor's work.

2. Provide materials and comply with installation requirements specified in Sections other than Contractor's own designated Specification Sections for above-listed items, as applicable.

B. Substitutions: Each contractor shall cooperate with other contractors involved to coordinate approved substitutions with remainder of the work.

C. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section, each contractor is responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility necessary for its own normal construction activity, and costs and use charges associated with each facility, except as otherwise provided for in this Section.

2. Temporary utilities, as follows:

a. Drinking water for its own construction personnel.
b. Provisions for dust, fumes, and odor control for its own activities.
c. Supplemental heating, cooling, and ventilation to be provided by the mechanical contractor.
d. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.

3. Support facilities, as follows:

a. Its own field office, complete with necessary furniture, and telephone service.
b. Its own storage sheds.
c. Traffic controls for its own construction activities.
d. Dewatering facilities and drains for its own construction activities.
e. Waste disposal facilities for collection and legal disposal of its own hazardous waste materials.
f. Shoring and bracing for its own construction activities.
g. Staging and scaffolding for its own construction activities.
h. Lifts and hoists for its own construction activities.

4. Security and protection facilities, as follows:

a. Environmental protection for its own construction activities.
b. Temporary erosion and sedimentation control for its own construction activities.
c. Security enclosure and lockup of its own tools, materials, and equipment.
d. Temporary enclosures for its own construction activities.
e. Temporary fire protection for its own construction activities.

5. Moisture and mold control.

6. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

D. Cleaning and Protection: Each contractor is responsible for the following:

1. Progress cleaning of work areas affected by its operations on a daily basis.
2. Protection of its own installed construction.
3. Final cleaning of its work and of work areas affected by its operations.

1.8 CONTRACT ASSIGNMENTS

A. Contract Assignments: In addition to specific responsibilities indicated in this Section, the contracts noted below are assigned certain responsibilities, as follows:

1. Excavation (including support and protection) shall be the work of the General Contract, unless required solely for the Work of another contract.

    a. Excavation for plumbing work within the building footprint and to a distance five feet outside the building footprint shall be the work of the Plumbing Contract.

        1) Excavation for natural-gas service shall be the work of the Plumbing Contract.

    b. Excavation for mechanical work shall be the work of the Mechanical Contract.

    c. Excavation for electrical work shall be the work of the Electrical Contract.

2. Blocking (including roof blocking) for the work of each contract shall be the work of the General Contract. Each contract is responsible for identifying blocking sizes and locations for its own work and advising of the General Contractor of such, in writing, in a timely manner.

3. Openings in walls, floors and roofs:

    a. In new surfaces: Providing openings, including lintels and structural framing shall be the work of the General Contract. Each contract is responsible for identifying opening sizes and locations for its own work and advising the General Contractor of such, in writing, in a timely manner.

    b. In existing surfaces: Providing openings, including lintels and structural framing shall be the work of each contract for its own work.

    c. Size lintels and structural framing for openings in accordance with the information on the Drawings.

    d. Provide openings by personnel experienced in work similar to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

4. Furnishing of access panels for the work of each contract shall be the work of each prime contract for its own work.

    a. In new surfaces: Installing access panels shall be the work of the General Contract.
    b. In existing surfaces: Installing access panels shall be the work of each contract for its own work.

5. Furnishing roof-mounted equipment curbs for the work of each contract shall be the work of each contract for its own work.

    a. Installing roof-mounted equipment curbs (including flashing and sealing as well as any required structural steel) shall be the work of the General Contract.

6. Furnishing vandal-resistant roof vent caps and roof drain clamping ring, adjustable extensions and dome strainers, shall be the work of the Plumbing Contract.

    a. Installing vandal-resistant roof vent caps and roof drain clamping ring, adjustable extensions and dome strainers shall be the work of the General Contract.

7. Painting for the work of each contract shall be the work of the General Contract, except as follows:

    a. Identification painting (such as for piping and equipment) for the work of each contract shall be the work of each contract for its own work.

8. Kitchen Areas:

    a. Providing all stainless-steel fabrications shall be the work of the Food Service Contractor per spec No. 11 40 00. Providing all stainless-steel wall/trim finishes outside of Food Service Contract shall be the work of the General Contractor.

    b. Providing the Kitchen and Food Preparation Equipment shall be the work of the Food Service Contractor.

    c. Providing the cooler and freezer, including condensers, insulated condensate piping, and associated supports to drain shall be the work of the Food Service Contractor.

    d. Furnishing Kitchen hand sinks shall be the work of the Food Service Contractor.

        1) Installing the Kitchen hand sinks shall be the work of the Plumbing Contractor.

    e. Furnishing two and three compartment sinks shall be the work of the Food Service Contractor.

        1) Installing the two and three compartment sinks shall be the work of the Plumbing Contractor.

f. Furnishing the dishwasher system and dishwasher booster heater shall be the work of the Food Service Contractor.

1) Furnishing and installing the dishwasher system, including booster heater, vent cowls (exhaust hoods) and associated fans shall be the work of the Food Service Contractor.

2) Installing the dishwasher and dishwasher booster heater wiring and devices shall be the work of the Electrical Contractor.

3) Installing the dishwasher and dishwasher booster heater piping and associated appurtenances shall be the work of the Plumbing Contractor.

4) Installing condensate drain on vent cowls (exhaust hoods) shall be the work of the Plumbing Contractor.

5) Providing exhaust ductwork and connections associated with the dishwasher system shall be the work of the Mechanical Contractor.

g. Furnishing Kitchen equipment specific (i.e. kettles, braising pans) shall be the work of the Food Service Contractor.

1) Furnishing and Installing the trench drains for specific Kitchen Equipment to be by the Plumbing Contractor. The connection to the building's sewer system shall be the work of the Plumbing Contractor.

2) Providing general floor drains, floor sinks and trench drains shall be the work of the Plumbing Contractor.

h. Furnishing water filtration/treatment systems for specific Kitchen Equipment shall be the work of the Food Service Contractor.

1) Installing the water filtration/treatment systems for specific Kitchen Equipment shall be the work of the Plumbing Contractor.

i. Providing the whips, devices and final electrical connections to Kitchen Equipment shall be the work of the Electrical Contractor.

j. Furnishing flexible connectors for final plumbing connections of Kitchen Equipment shall be the work of the Food Service Contractor.

1) Installing the flexible connectors to Kitchen Equipment and providing the final plumbing connections shall be the work of the Plumbing Contractor.

k. Furnish and install the exhaust hood, including hood lighting and contractor designed fire suppression system**,** including gas safety shut-off valve shall be the work of the Food Service Contractor.

1) Providing the exhaust fans and make-up air unit for the exhaust hood shall be the work of the Food Service Contractor.

a) Providing the gas solenoid valve for the roof-top make up air unit shall be the work of the Plumbing Contractor.

2) Installing the exhaust/make-up air ductwork between the exhaust hoods and the make-up air units shall be the work of the Mechanical Contractor.

3) Providing the interconnection controls between the exhaust hood and the make-up air unit shall be the work of the Mechanical Contractor.

4) Installing the wiring and conduit for the exhaust hood lighting shall be the work of the Electrical Contractor.

5) Proving for means of automatic shutdown of Kitchen Equipment under the exhaust hoods shall be the work of the Electrical Contractor.

6) Providing fire alarm connections to the exhaust hood fire suppression system shall be the work of the Electrical Contractor.

7) Installing the automatic gas safety shut-off valve in the gas piping under the exhaust hood shall be the work of the Plumbing Contractor.

l. Providing all room signage, including electrical display signage, shall be the work of the General Contractor.

1) Providing wiring, devices and conduit to electrical signage shall be the work of the Electrical Contractor.

m. Providing all the interconnection between exhaust/make-up air fans and the fire alarm system shall be the work of the Electrical Contractor.

n. Providing interior grease interceptors/recovery units shall be the work of the Plumbing Contractor.

1) Providing the GFI power receptacle and associated wiring for the grease recovery unit shall be the work of the Electrical Contractor.

o. Providing data wiring and devices at cash register locations shall be the work of the Electrical Contractor.

9. Plumbing Fixture Flushing operation:

a. Flushing valves are to be furnished and installed by Plumbing Contractor.

1) Flush valves are to be manual.

10. Providing linear grilles for casework shall be the work of the General Contract.

11. Radon Mitigation: Providing imported fill drainage course for concrete slabs-on-grade and vapor barrier/retarder system, including sealing of joints, penetrations and perimeters shall be the work of the General Contract.

a. Providing radon mitigation piping and equipment shall be the work of the Plumbing Contract.

12. Furnishing mechanical louvers and grilles for exterior walls shall be the work of the Mechanical Contract.

    a. Installing louvers and grilles for exterior walls (including flashing and sealing) shall be the work of the General Contract.

13. Furnishing motor starters for the work of each contract shall be the work of each contract for its own work.

    a. Installing constant speed motor starters and disconnects shall be the work of the Electrical Contract.
    b. Installing Variable Frequency Motor Controllers and disconnects shall be the work of the Electrical Contract.

14. Providing automatic door operators shall be the work of the General Contractor. DAY Automation will be installing control wiring from activation device (push-plate switch) to operator. Coordination between GC and DAY required.

    a. Providing line voltage power to operator shall be the work of the Electrical Contract.
    b. Installing control wiring from activation device (push-plate switch) to operator is by Day Automation .Integration into access control is by DAY automation.

15. Contractors' Preliminary Construction Schedule: At the Preconstruction Conference, the General Contractor shall submit a preliminary horizontal bar-chart-type construction schedule in accordance with Division 01 Section “Construction Progress Documentation”. At the initial progress meeting, each contract shall submit a matching preliminary horizontal bar-chart schedule showing construction operations sequenced and coordinated with overall construction in accordance with Division 01 Section “Construction Progress Documentation”.

    a. The schedules shall be mutually coordinated by the contractors, and the General Contractor shall perform the administrative task of producing a composite master schedule and distributing to Architect, Construction Manager**,** Owner, separate contractors, testing and inspecting agencies, and other parties with a need-to-know schedule responsibility.

16. Contractors' Construction Schedules: At intervals provided in Division 01 Section “Construction Progress Documentation”, each contract shall update its schedule, from which the General Contractor shall produce a composite master schedule.

    a. The General Contractor shall distribute composite master schedules to Architect, Construction Manager**,** Owner, separate contractors, testing and inspecting agencies, and other parties with a need-to-know schedule responsibility. Schedule needs to be updated and maintained throughout the life of the project.

17. Provide work specified in Sections other than Contractor’s own designated Specification Sections for above-listed items, as applicable.

18. Temperature Controls: All temperature controls shall be provided by the Owner's temperature controls vendor (Stark Tech/ Day Automation), including but not limited to:

1. Labor, installation, project management, software, engineering, check-out, training, close out documentation, and warranty for all temperature control/ building automation control devices.

2. Required temperature control/ building automation system programming, testing, system graphics and system commissioning.

3. Removal and reinstallation, and/or furnishing new end devices and control panels.

4. Demolition of existing Temperature Controls as required per the Plans and Specs (Control Wiring, Space Temperature Sensors, Sensors, Panels, Controllers, Line Voltage Thermostats/Wiring).

5. Cabling and field terminations for all control wiring.

6. Coordination with Mechanical Contractor and Electrical Contractor:
   a. Mechanical Contract Requirements:
   i. Mechanical equipment third party BACnet integration devices, that will be utilized to interface with the temperature control system and components, shall be included with the unit from the manufacturer. Existing temperature controls system is EcoStructure.
   b. Electrical Contract Requirements:
   i. Provide all wire, conduit, breakers, terminations to power all mechanical equipment on the contract documents.
   ii. Provide all required disconnects and variable frequency drives as required by the contract drawings and specifications.

19. Security: All security devices shall be provided by the Owner's Security Vendor (Stark Tech/ Day Automation), including but not limited to:

1. Access Control: All devices for access control, including credential readers, door controller cards, intercoms, cabling, end terminations and motion detectors, shall be provided by the Owner's Security Vendor.
2. Coordination with the General Contractor:
   a. General Contract Requirements:
   i. Furnish all door hardware components, including electric Strikes and door contacts/ position switches, as indicated in the contract drawings and specifications. Owner's Security Vendor shall install and wire all electric strikes and door contacts/ position switches.
   b. Electrical Contract Requirements: None.”

B. Field Engineering and Surveying: The General Contract is responsible for field engineering and surveying.

C. Temporary HVAC: The Mechanical Contract is responsible for temporary HVAC before permanent enclosure of building is complete and all associated costs. The General Contract is responsible for temporary HVAC after permanent enclosure of building is complete, but Owner will pay utility-use charges.

1. Use of permanent systems for temporary HVAC is prohibited.

D. Temporary Ventilation: The Mechanical Contract is responsible for temporary ventilation before permanent enclosure of building is complete and all associated costs. The General Contract is responsible for temporary ventilation after permanent enclosure of building is complete, but Owner will pay utility-use charges.

1. Use of permanent systems for temporary ventilation is prohibited.

E. Waste Disposal and Recycling Facilities: For debris not classified as hazardous waste, the General Contract is responsible for providing waste-collection and recycling containers, including all costs for hauling, tipping fees, and placement on site.

1. Each contractor is responsible for daily collection of its own waste materials and disposal into the waste-collection containers that are provided by the General Contract.

2. Each contractor is responsible for daily collection of its own recyclable waste and disposal into recycling containers or bins, as well as daily inspection of containers or bins for contamination and removal of contaminated materials.

F. Equipment Coordination: Refer to "Connection Schedule" at the end of this Section for each contract's responsibilities.

1.9 GENERAL CONTRACT REQUIREMENTS

A. Unless noted otherwise, Work in the General Contract includes, but is not limited to, that shown on the following Drawings:

1. Title Sheets.
2. Symbols and Abbreviations (G) Drawings.
3. Code Compliance (G) Drawings.
4. General Information (G) Drawings.
5. Phasing (G) Drawings.
6. Hazardous Materials (H) Drawings.
7. Civil/Landscape (C) Drawings.
8. Structural (S) Drawings.
9. Architectural (A) Drawings.

B. Unless noted otherwise, Work in the General Contract includes, but is not limited to, that covered by the following Specifications:

1. Division 01 (General Requirements) Specification sections.

2. Division 02 (Existing Conditions) Specification sections and as follows.

3. Division 02 (ABATEMENT) 028200 Asbestos Abatement, 028400 Haz Materials Removal Included by GC

4. Division 03 (Concrete) Specification sections.

5. Division 04 (Masonry) Specification sections.

6. Division 05 (Metals) Specification sections and as follows:

    a. Provide all necessary structural support as required for the installation of kitchen equipment, secure entrance also including teller window, mechanical support steel needed for new and existing RTU's

7. Division 06 (Wood, Plastics, and Composites) Specification sections.

8. Division 07 (Thermal and Moisture Protection) Specification sections.

9. Division 08 (Openings) Specification sections.

10. Division 08 (HARDWARE) Specification sections.

11. Division 09 (Finishes) Specification sections and as follows:

    a. Perform all work associated with preparing surface to receive new finishes as specified by manufacturer.

12. Division 10 (Specialties) Specification sections.

13. Division 11 (Equipment) Specification sections.

        1) Food Service Equipment (Coordination with this PRIME will be required)

14. Division 12 (Furnishings):

    a. 12 24 13 Roller Window Shades
    b. 12 32 13 Manufactured Wood-Veneer- Faced Casework
    c. 12 32 16 Manufactured Plastic- Laminate- Faced Casework

15. Division 31 (Earthwork) Specification sections. General trades excavation and paving work by the GC

16. Division 32 (Exterior Improvements) Specification sections.

17. Division 33 (Utilities) Specification sections.

C. Temporary facilities and controls in the General Contract include, but are not limited to, the following:

1. Support facilities, as follows:

a. Temporary roads and paved areas.
b. Snow and ice removal.
c. Project signs.
d. Temporary stairs.

2. Security and protection facilities, as follows:

a. Environmental protection.
b. Stormwater control.
c. Tree and plant protection.
d. Pest control.
e. Site enclosure fence.
f. Security enclosure and lockup.
g. Barricades, warning signs, and lights.
h. Temporary railings.
i. Temporary egress.
j. Covered walkways.
k. Temporary partitions.
l. Temporary fire-protection facilities.

3. Restoration of Owner's existing facilities used as temporary facilities.

1.10 MECHANICAL CONTRACT REQUIREMENTS

A. Unless noted otherwise, Work in the Mechanical Contract includes, but is not limited to, that shown on the following Drawings:

1. Title Sheets.
2. Symbols and Abbreviations (G) Drawings.
3. General Information (G) Drawings.
4. Code Compliance (G) Drawings.
5. Phasing (G) Drawings.
6. Mechanical (M) Drawings.

B. Unless noted otherwise, Work in the Mechanical Contract includes, but is not limited to, the following:

1. Division 01 (General Requirements) Specification sections.

2. Division 02 (Existing Conditions) Specification sections.

3. Division 03 (Concrete) Specification sections, as follows:

a. 03 30 53 Miscellaneous Cast-in-Place Concrete as required for the Work of this Contract.

4. Division 05 (Metals) Specification sections, as follows:

a. 05 50 00 Metal Fabrications, as required for the Work of this Contract.

5. Division 07 (Thermal and Moisture Protection) Specification sections, as follows:

a. 07 21 00 Thermal Insulation, as required for the Work of this Contract.
b. 07 84 13 Penetration Firestopping, as required for the Work of this Contract.
c. 07 92 00 Joint Sealants, as required for the Work of this Contract.

6. Division 08 (Openings) Specification sections, as follows:

a. 08 31 13 Access Doors and Frames, as required for the Work of this Contract.

7. Division 23 (Heating, Ventilating and Air Conditioning) Specification sections and as follows:

a. 23 08 00 Commissioning of HVAC, provide necessary labor and materials for completion of commissioning as indicated by Commissioning Agent.
b. 23 09 00 Instrumentation and Control for HVAC, Provide mechanical support as necessary for successful implementation of HVAC Instrumentation and Controls

C. Temporary facilities and controls in the Mechanical Contract include, but are not limited to, the following:

1. Temp Heat/Cooling/Humidity control as needed

1.11 ELECTRICAL CONTRACT REQUIREMENTS

A. Unless noted otherwise, Work in the Electrical Contract includes, but is not limited to, that shown on the following Drawings:

1. Title Sheets.
2. Symbols and Abbreviations (G) Drawings.
3. General Information (G) Drawings.
4. Code Compliance (G) Drawings.
5. Phasing (G) Drawings.
6. Electrical (E) Drawings.

B. Unless noted otherwise, Work in the Electrical Contract includes, but is not limited to, the following:

1. Division 01 (General Requirements) Specification sections.

2. Division 02 (Existing Conditions) Specification sections.

3. Division 03 (Concrete) Specification sections, as follows:

a. 03 30 53 Miscellaneous Cast-in-Place Concrete as required for the Work of this Contract.

4. Division 05 (Metals) Specification sections, as follows:

a. 05 50 00 Metal Fabrications, as required for the Work of this Contract.

5. Division 07 (Thermal and Moisture Protection) Specification sections, as follows:

a. 07 21 00 Thermal Insulation, as required for the Work of this Contract.
b. 07 84 13 Penetration Firestopping, as required for the Work of this Contract.
c. 07 92 00 Joint Sealants, as required for the Work of this Contract.

6. Division 08 (Openings) Specification sections, as follows:

a. 08 31 13 Access Doors and Frames, as required for the Work of this Contract.
b. 0 87 100 Door hardware – Coordination of access control hardware with GC and DAY Automation.

7. Division 11 (Equipment) Specification Sections.

a. Provide all required electrical connections, circuitry, pathways, and wiring.

8. Division 12 (Furnishings) Specifications sections.

a. Provide all required electrical connections, circuitry, pathways, and wiring.

9. Division 23 (Heating, Ventilating and Air Conditioning) Specification sections, as follows.

a. 23 08 00 Commissioning of HVAC, provide necessary electrical support for completion of commissioning as indicated by Commissioning Agent.
b. 23 09 00 Instrumentation and Control for HVAC, Provide electrical support as necessary for successful implementation of HVAC Instrumentation and Controls.

10. Division 26 (Electrical) Specification sections.

11. Division 28 (Electronic Safety and Security) Specification sections.

12. Division 27 (Communications) Specification sections.

13. Division 31 (Earthwork) Specification sections. Excavation needed for your electrical work is by the EC.

C. Temporary facilities and controls in the Electrical Contract include, but are not limited to, the following:

1. Temporary utilities, as follows:

a. Electric power service and distribution.
b. Lighting, including site lighting.

2. Electric Power Service from Generator: Provide electric power service via a generator, including fuel, for use by all construction entities for construction purposes and construction field offices until permanent system is available for use.

3. Electric Power Service from Permanent System: Electric power from permanent system is available for use. Provide metering, connections and extensions of services as required for construction operations. Separate metering for field offices from that for other construction purposes.

   a. Construction Use Charges: Arrange for electric power service use charges for construction purposes to be billed directly from power company to Owner.

   b. Field Office Use Charges: Pay electric power service use charges for electricity used by all entities for construction field offices.

      1) Maximum one 100 A, 240 V, single-phase connection per construction field office. Assume a diversified peak connected load factor of 12 kW.
      2) Maximum number of construction field offices: One per contract plus Project Representative field office.

4. Restoration of Owner's existing facilities used as temporary facilities

1.12 PLUMBING CONTRACT REQUIREMENTS

A. Unless noted otherwise, Work in the Plumbing Contract includes, but is not limited to, that shown on the following Drawings:

1. Title Sheets.
2. Symbols and Abbreviations (G) Drawings.
3. General Information (G) Drawings.
4. Code Compliance (G) Drawings.
5. Phasing (G) Drawings.
6. Fire Protection (F) Drawings.
7. Plumbing (P) Drawings.

B. Unless noted otherwise, Work in the Plumbing Contract includes, but is not limited to, the following:

1. Division 01 (General Requirements) Specification sections.

2. Division 02 (Existing Conditions) Specification sections.

3. Division 03 (Concrete) Specification sections, as follows:

   a. 03 30 53 Miscellaneous Cast-in-Place Concrete as required for the Work of this Contract.

4. Division 05 (Metals) Specification sections, as follows:

   a. 05 50 00 Metal Fabrications, as required for the Work of this Contract.

5. Division 07 (Thermal and Moisture Protection) Specification sections, as follows:

    a. 07 21 00 Thermal Insulation, as required for the Work of this Contract.
    b. 07 84 13 Penetration Firestopping, as required for the Work of this Contract.
    c. 07 92 00 Joint Sealants, as required for the Work of this Contract.

6. Division 08 (Openings) Specification sections, as follows:

    a. 08 31 13 Access Doors and Frames, as required for the Work of this Contract.

7. Division 22 (Plumbing) Specification sections.

8. Division 23 (Heating, Ventilating and Air Conditioning) Specification sections, as follows.

    a. 23 08 00 Commissioning of HVAC, provide necessary plumbing support for completion of commissioning as indicated by Commissioning Agent.

9. Division 31 (Earthwork) Specification sections. Excavation needed for your plumbing work is by the PC.

C. Temporary facilities and controls in the Plumbing Contract include, but are not limited to, the following:

1. Temporary utilities, as follows:

    a. Sanitary facilities by Plumbing Contract

    b. Water service - only if applicable.

2. Water Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for use by all entities for construction operations.

3. Restoration of Owner's existing facilities used as temporary facilities.

1.13 KITCHEN EQUIPMENT CONTRACT REQUIREMENTS

A. Work in the KITCHEN EQUIPMENT Contract includes, but is not limited to, the following:

1. Division 01 (General Requirements) Specification sections.

2. Division 02 (Existing Conditions) Specification sections.

3. Division 03 (Concrete) Specification sections, as follows:

a. 03 30 53 Miscellaneous Cast-in-Place Concrete as required for the Work of this Contract.

4. Division 05 (Metals) Specification sections, as follows:

a. 05 50 00 Metal Fabrications, as required for the Work of this Contract.

5. Division 07 (Thermal and Moisture Protection) Specification sections, as follows:

a. 07 21 00 Thermal Insulation, as required for the Work of this Contract.
b. 07 84 13 Penetration Firestopping, as required for the Work of this Contract.
c. 07 92 00 Joint Sealants, as required for the Work of this Contract.

6. Division 08 (Openings) Specification sections, as follows:

a. 08 31 13 Access Doors and Frames, as required for the Work of this Contract.

7. Division 11 KITCHEN Equipment (000000000)

8. Division 22 (Plumbing) Specification sections.

9. Division 23 (Heating, Ventilating and Air Conditioning) Specification sections, as follows.
a. 23 08 00 Commissioning of HVAC, provide necessary plumbing support for completion of commissioning as indicated by Commissioning Agent.

10. Division 26 (Electrical) Specification sections.

1.14 COOPERATIVE PURCHASE BUILDING CONTROLS CONTRACT REQUIREMENTS

A. Work in the Controls Contract includes, but is not limited to, the following:

1. Division 01 (General Requirements) Specification sections.

2. Division 02 (Existing Conditions) Specification sections.

3. Division 03 (Concrete) Specification sections, as follows:

a. 03 30 53 Miscellaneous Cast-in-Place Concrete as required for the Work of this Contract.

4. Division 05 (Metals) Specification sections, as follows:

a. 05 50 00 Metal Fabrications, as required for the Work of this Contract.

5. Division 07 (Thermal and Moisture Protection) Specification sections, as follows:

a. 07 21 00 Thermal Insulation, as required for the Work of this Contract.
b. 07 84 13 Penetration Firestopping, as required for the Work of this Contract.
c. 07 92 00 Joint Sealants, as required for the Work of this Contract.

6. Division 08 (Openings) Specification sections, as follows:

    a. 08 31 13 Access Doors and Frames, as required for the Work of this Contract.

7. Division 11 (Equipment) Specification Sections.

    a. Provide all required electrical connections, circuitry, pathways, and wiring.

8. Division 12 (Furnishings) Specifications sections.

    a. Provide all required electrical connections, circuitry, pathways, and wiring.

9. Division 23 (Heating, Ventilating and Air Conditioning) Specification sections, as follows.

    a. 23 08 00 Commissioning of HVAC, provide necessary electrical support for completion of commissioning as indicated by Commissioning Agent.
    b. 23 09 00 Instrumentation and Control for HVAC, Provide electrical support as necessary for successful implementation of HVAC Instrumentation and Controls.

10. Division 26 (Electrical) Specification sections.

11. Division 28 (Electronic Safety and Security) Specification sections.

12. Division 27 (Communications) Specification section

13. Restoration of Owner's existing facilities used as temporary facilities.

1.15 COOPERATIVE PURCHASE SECURITY CONTRACT REQUIREMENTS

A. Work in the SECURITY Contract includes, but is not limited to, the following:

1. Division 01 (General Requirements) Specification sections.

2. Division 02 (Existing Conditions) Specification sections.

3. Division 03 (Concrete) Specification sections, as follows:

    a. 03 30 53 Miscellaneous Cast-in-Place Concrete as required for the Work of this Contract.

4. Division 05 (Metals) Specification sections, as follows:

    a. 05 50 00 Metal Fabrications, as required for the Work of this Contract.

5. Division 07 (Thermal and Moisture Protection) Specification sections, as follows:

    a. 07 21 00 Thermal Insulation, as required for the Work of this Contract.
    b. 07 84 13 Penetration Firestopping, as required for the Work of this Contract.
    c. 07 92 00 Joint Sealants, as required for the Work of this Contract.

6. Division 08 (Openings) Specification sections, as follows:

    a. 08 31 13 Access Doors and Frames, as required for the Work of this Contract.

7. Division 11 (Equipment) Specification Sections.

    a. Provide all required electrical connections, circuitry, pathways, and wiring.

8. Division 12 (Furnishings) Specifications sections.

    a. Provide all required electrical connections, circuitry, pathways, and wiring.

9. Division 23 (Heating, Ventilating and Air Conditioning) Specification sections, as follows.

    a. 23 08 00 Commissioning of HVAC, provide necessary electrical support for completion of commissioning as indicated by Commissioning Agent.
    b. 23 09 00 Instrumentation and Control for HVAC, Provide electrical support as necessary for successful implementation of HVAC Instrumentation and Controls.

10. Division 26 (Electrical) Specification sections.

11. Division 28 (Electronic Safety and Security) Specification sections.

12. Division 27 (Communications) Specification sections.

13. Restoration of Owner's existing facilities used as temporary facilities.

1.16 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work for the Contract identified includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.

B. Owner-Furnished Products:

    1. Select Food service equipment to be reused.

C. Owner-Furnished Products Procured under State Contract: N/A

1.17 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.18 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Construction Manager and approval of authorities having jurisdiction.

2. Maintain in operation all life safety provisions and devices (including, but not limited to, fire alarms, fire extinguishers, smoke detectors, heat sensors, emergency and exit lighting, defibrillators, and similar items).

3. Notify the Construction Manager 72 hours in advance of activities that will affect Owner's operations.

B. Coordination with School Schedule:

1. Normal School Year: Owner intends to maintain a full educational program during the normal school year throughout duration of Project, and will make full use of the building and site, unless noted otherwise.

   a. School and special activities may be conducted within building and on site outside regular school hours, including holidays and weekends.

   b. Owner's personnel will perform normal custodial and maintenance services for the building areas and systems not involved in construction activities, unless noted otherwise.

2. Summer: Owner will be having football and soccer practice or organized recreation activities at the building or site. 8-30-26 is the first football game.

   a. Owner will staff building, at a minimum, with administrative, custodial and maintenance personnel during summer period.

C. Identification: The Contractor shall require its personnel and those of its subcontractors, sub-subcontractors and suppliers to wear yellow safety vests and visible photo-identification badges acceptable to the Owner, at all times for identification and security purposes.

1.19 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal business working hours of 7 a.m. to 3:30 p.m., Monday through Friday, except as otherwise indicated. Movement of materials is not permitted in Owner-occupied areas during normal business working hours.

1. Other Weekday Hours: As needed, coordinate with the CM.
2. Weekend Hours: Coordinate with the CM.
3. Hours for Noisy Activity (in excess of 60 dB): only when school is in session
4. All Prime contractors to work what is needed to maintain or exceed the published schedule at their own expense.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Construction Manager not less than 72 hours in advance of proposed utility interruptions.
2. Obtain Construction Manager's/Owners written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy.

1. Notify Construction Manager not less than 72 hours in advance of proposed disruptive operations.
2. Obtain Construction Manager's written permission before proceeding with disruptive operations.

E. Indoor Air Quality (IAQ): Protect indoor air quality, including control of emissions and moisture control during construction. Develop a construction IAQ management plan to be followed.

1. Control of Emissions: Provide measures and conduct operations to:

a. Protect HVAC systems.

b. Protect against emissions from such sources as environmental tobacco smoke, combustion contaminants, biological contaminants, volatile organic compounds (VOCs), formaldehyde, soil gases, pesticides, particles and fibers.

c. Provide low- and zero-VOC materials.

d. Protect against dust infiltration, especially during dust-producing activities.

e. Isolate work areas to prevent contamination of clean or occupied spaces.

f. Continuously maintain and regularly inspect areas and IAQ measures to prevent contamination of building areas.

g. Provide adequate ventilation, including, but not limited to:

1) Adequate ventilation during and after installation of interior wet products and interior final finishes, and
2) Appropriate air filtration, including filter replacement.

h. Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.

i. Vacuum carpeted and soft surfaces with a high-efficiency particulate arrestor (HEPA) vacuum.

j. Flush out building for a minimum of 72 hours, or longer if required to dissipate emissions, prior to occupancy.

2. Moisture Control: Provide measures and conduct operations to:

a. Provide proper housekeeping to keep materials dry.
b. Inspect areas and materials for dampness and mold growth.
c. Schedule construction operations so that absorptive materials are protected and weather-proof building as quickly as possible.
d. Test for moisture content, moisture penetration and microbial growth to maintain within permissible limits.

F. Comply with requirements in Division 01 Section “Governmental Safety Requirements”.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 12 00

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Contingency allowances.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances.

1.4 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work.

B. Allowance shall include cost to Contractor of specific products and materials under allowance and shall include taxes, freight, and delivery to Project site.

C. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.6 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes.

B. Allowance shall include cost to Contractor of specific products and materials under allowance and shall include taxes, freight, and delivery to Project site. Contractor's costs for receiving and handling at Project site, labor, installation, and similar costs related to products and materials under allowance shall be included as part of the allowance.

C. Contractor’s Overhead and profit related to the allowance shall be included as part of the Contract Sum and not part of the allowance, however subcontractor Overhead and profit may be part of allowance.

1.7 ALLOWANCE PROCEDURES

A. Authorization for use of allowances is documented through Allowance Access Authorization form provided in the Project Manual, accompanied by substantiating data.

B. At Project closeout, unused amounts remaining in the allowances will be credited to Owner by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 SCHEDULE OF ALLOWANCES - GENERAL CONTRACT

A. Allowance No. GC-01: Contingency Allowance: Include the sum of $50,000 for use according to Owner’s instructions.

3.3 SCHEDULE OF ALLOWANCES - PLUMBING CONTRACT

A. Allowance No. PC-01: Contingency Allowance: Include the sum of $10,000 for use according to Owner’s instructions.

3.4 SCHEDULE OF ALLOWANCES - MECHANICAL CONTRACT

A. Allowance No. MC-01: Contingency Allowance: Include the sum of $15,000 for use according to Owner's instructions.

3.5 SCHEDULE OF ALLOWANCES - ELECTRICAL CONTRACT

A. Allowance No. EC-01: Contingency Allowance: Include the sum of $50,000 for use according to Owner's instructions.

Attachment: Allowance Access Authorization

END OF SECTION 01 21 00

ALLOWANCE ACCESS AUTHORIZATION:

Project: Additions and Alterations to Elm Street Elementary School Phase 2 Re-Bid

Architect: Tetra Tech Architects & Engineers **Project No. 339070-25002**

Contractor:

AAA No.: **Initiation Date:**

The Allowance is allocated as follows:

Total original Contract Allowance was:	$
Amount of Contract Allowance Access previously authorized:	$
Adjusted Contract Allowance prior to this authorization is:	$
The amount of available Allowance will Decrease by this Access Authorization:	$
The remaining Contract Allowance, after this Access Authorization will be:	$

Recommended by:
Architect

By (Signature): _____

Date: _____

Recommended by:
Construction Manager

By (Signature): _____

Date: _____

Accepted by:
Contractor

By (Signature): _____

Date: _____

Approved by:
Owner

By (Signature): _____

Date: _____

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.

2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 01 – Additional Acoustic Wall Panels:

1. This Alternate affects Contract, as follows:

a. General Contract: Provide additional acoustic wall panels as shown on BA401.

b. Plumbing Contract: Not applicable.

c. Mechanical Contract: Not applicable.

d. Electrical Contract: Not Applicable.

e. Food Service Contract: Not applicable.

B. Alternate No. 02 – Exterior Ramp:

1. This Alternate affects Contract, as follows:

a. General Contract: Provide exterior concrete ramp work as shown on BS130, BS600, BC100, BC110, BC1120, BC130, BC140, BC500 and BC501.

b. Plumbing Contract: Not applicable.

c. Mechanical Contract: Not applicable.

d. Electrical Contract: Not Applicable.

e. Food Service Contract: Not applicable.

C. Alternate No. 03 – Parking Lot Renovations:

1. This Alternate affects Contract, as follows:

a. General Contract: Provide parking lot renovation work as shown on BC100, BC110, BC1120, BC130, BC140, BC500 and BC501.

b. Plumbing Contract: Not applicable.

c. Mechanical Contract: Not applicable.

d. Electrical Contract: Not Applicable.

e. Food Service Contract: Not applicable.

D. Alternate No. 04 – Courtyard Exterior Lighting:

1. This Alternate affects Contract, as follows:

a. General Contract: Not applicable.

b. Plumbing Contract: Not applicable.

c. Mechanical Contract: Not applicable.

d. Electrical Contract: Provide pole mounted exterior decorative lighting in entry courtyard as shown on BE001 and specified in 26 56 00 - LED Exterior Lighting and 26 56 13 - Lighting Poles and Standards.

e. Food Service Contract: Not applicable.

END OF SECTION 01 23 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor,

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use the “Request for Substitution” form attached to this Specification Section. Complete all sections of the form.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Information to support identification of the proposed substitution as “for Cause” or “for Convenience”.

b. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

c. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

d. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

e. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

f. Samples, where applicable or requested.

g. Certificates and qualification data, where applicable or requested.

h. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

i. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

j. Evidence of compliance with building code in effect for Project.

k. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

l. Cost information, including a proposal of change, if any, in the Contract Sum.

m. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

n. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation. Such additional information or documentation may include detailed side-by-side comparison charts of the specified product and the proposed substitution, and other data. Only one substitution request for each product will be considered. Architect will make final determination as to whether the substitution is “for Cause” or “for Convenience”.

   a. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution.

b. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution is compatible with other portions of the Work.

e. Requested substitution has been coordinated with other portions of the Work.

f. Requested substitution provides specified warranty.

g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 15 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

d. Substitution request is fully documented and properly submitted.

e. Requested substitution will not adversely affect Contractor's construction schedule.

f. Requested substitution is compatible with other portions of the Work.

g. Requested substitution has been coordinated with other portions of the Work.

h. Requested substitution provides specified warranty.

i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

Attachment: Request for Substitution Form

END OF SECTION 01 25 00

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ARCHITECTS & ENGINEERS

Request for Substitution

This form must be completely filled in with all relevant data by the Prime Contractor and submitted to the Architect in accordance with Project Manual Requirements for consideration before any request to change the drawing or specification requirements will be considered.

REFERENCE DATA

Project name:_____ Date of Request:_____

Location:_____ Architect's Project No:_____

Request by Contractor:_____

Address:_____

Contact person:_____ Phone:_____ Email:_____

SUBSTITUTION REQUEST DATA

(Provide statement indicating why specified product, fabrication or installation cannot be provided.)

SUBSTITUTION REQUESTED IS FOR:

☐ Named product.

☐ Product type, material, finish or formulation.

☐ Fabrication or installation methods.

Reason for request:_____

Note whether substitution is for cause or convenience:_____

PRODUCT / MATERIAL / METHOD FOR WHICH SUBSTITUTION IS REQUESTED IS SHOWN ON THE FOLLOWING DOCUMENTS:

Specification: Section No:_____ Page(s):_____ Paragraph/Item No.:_____

Drawings: (List No's of all Drawings affected):_____

DETAILED COMPARISON

Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

COST/BENEFIT ANALYSIS

Describe in detail any alteration to any other part of the Works required by use of the requested substitution, including work by other Prime Contractors:

If applicable total net cost of any such other project required alterations, including overhead and profit: $_____
(Indicate if cost is an "Add" or "Deduct" to contract sum.

Benefits to Owner other than financial:_____

Schedule impact (Note any impact on project schedule by proposed substitution):_____

ADDITIONAL INFORMATION REQUIRED

PRIME CONTRACTOR TO PROVIDE ADDITIONAL INFORMATION AS NECESSARY AND ATTACH THE FOLLOWING INFORMATION:

1. Manufacturer's technical data sheets on proposed products, including test results as applicable.
2. Manufacturer's standard form of warranty.
3. Letter on manufacturer's letterhead stating that manufacturer will warrant products as specified, if specification requires specific warranties not included in manufacturer's standard form of warranty.
4. Letter(s) from other Prime Contractor(s) responsible for works affected by proposed substitution which state the total cost(s) of all such work, if any alteration of other work is required. Prime Contractor submitting this Request for Substitution will be responsible to fully reimburse the Owner for all such additional costs; processed via a deduct Change Order.

CONTRACTOR'S CERTIFICATION

1. BY SUBMISSION OF THIS SUBSTITUTION REQUEST AND PER SIGNATURE BELOW, CONTRACTOR CERTIFIES THIS SUBSTITUTION REQUEST HAS BEEN REVIEWED AND APPROVED BY THE CONTRACTOR IN ACCORDANCE WITH THE PROJECT MANUAL REQUIREMENTS.
2. BY SUBMISSION OF THIS SUBSTITUTION REQUEST AND PER SIGNATURE BELOW CONTRACTOR CERTIFIES THE PROPOSED SUBSTITUTION COMPLIES WITH ALL APPLICABLE REQUIREMENTS OF THE CONTRACT DOCUMENTS AND REFERENCED CODES AND STANDARDS.
3. BY SUBMISSION OF THIS SUBSTITUTION REQUEST AND PER SIGNATURE BELOW CONTRACTOR HEREBY WAIVES ALL RIGHTS TO ADDITIONAL COMPENSATION OR TIME THAT MAY SUBSEQUENTLY BECOME NECESSARY BECAUSE OF FAILURE OF PROPOSED MATERIAL TO PRODUCE THE INDICATED AND REQUIRED RESULTS.

Name of Authorized Contractor Representative: _____

Signature of Authorized Contractor Representative: _____

Name of Contractor_____

Date_____

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, via the electronic form procedures outlined in Division 01 Section “Project Management and Coordination” and during the preconstruction conference.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time, via the electronic form procedures outlined in Division 01 Section “Project Management and Coordination” and during preconstruction conference. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

2. Unless otherwise noted, within 14 days after receipt of Proposal Request, submit a quotation listing adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

    c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use forms acceptable to Architect.

f. If contractor fails to provide all information as noted above, Architect will return the submitted quotation noting the corrections required. If subsequent quotation submittal by the Contractor fails to comply with the format and protocols outlined above, the Owner is entitled for reimbursement from the Contractor for amounts paid to the Architect for review of additional quotation submissions.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may submit a request for a change to the Architect through Construction Manager.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

7. Proposal Request Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request response, Architect will issue a Change Order for signatures of Owner, Architect, Construction Manager and Contractor.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1. Subschedule: An itemized breakdown of each individual Description of Work item listed on the attached Continuation Sheets.

B. AIA Document: Current, authorized editions of standard forms issued by the American Institute of Architects (AIA).

1. Where AIA Documents are identified in this Section, the use of facsimiles of AIA documents or non-AIA documents is prohibited.

1.4 SCHEDULE OF VALUES

A. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than fourteen days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content:

1. Use AIA Document G703 as form for schedule of values, with entries typewritten.

2. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Architect's project number.
c. Contractor's name and address.
d. Date of submittal.

3. Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide line item(s) for each Specification Section.

4. Arrange the schedule of values to indicate the following for each item listed, completing columns A, B and C of AIA Document G703:

    a. Column A: Indicate Specification Section number.
    b. Column B: Indicate Specification Section title, and provide separate line items for labor and materials.
    c. Column C: Provide separate line item dollar values for labor and materials. Round amounts to nearest whole dollar.
    d. Each page needs to be subtotaled as well as building subtotals.

5. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment. In addition to line items for each applicable specification section, include the following:

    a. Multiple line items for amounts in excess of five percent of Contract Sum, broken out to subcomponents equaling not greater than five percent each.

    b. Project Startup:

        1) Include separate line items for project startup requirements, including the following separate line items:

            a) Insurance, based on actual invoice amount.
            b) Performance and payment bonds, based on actual invoice amount.
            c) Mobilization.
            d) Temporary facilities and controls.

    c. Allowances: Provide a separate line item in the schedule of values for each allowance.

    d. Submittals: Include a minimum of two percent (2%) of Contract Sum.

    e. Supervision: Include a minimum of two percent (2%) of Contract Sum.

    f. Safety and Field Reports: Include a minimum of one percent (1%) of Contract Sum.
    g. Coordination Drawings: Provide a separate line item in the schedule of values for Coordination Drawings. Include a minimum of the following percentages of Contract Sum.

        1) Mechanical Contract: Two percent (2%) of the Contract Sum.

        2) All Other Contracts: Two percent (2%) of the Contract Sum.

    h. Meetings: Provide a separate line item in the schedule of values for Contractor attendance at meetings. Include a minimum of two percent (2%) of Contract Sum.

i. Wood Blocking: Provide a separate line item in the schedule of values for wood blocking.

j. Testing and Balancing (TAB): Include a minimum of three percent (3%) of the Contract Sum. Mechanical Contract: three percent (3%) as separate line items for testing and balancing requirements, as follows:

1) Pre-TAB activities (20 percent of TAB).
2) TAB activities (40 percent of TAB).
3) Final TAB reports. (40 percent of TAB).

k. Punch List: Three percent (3%) of Contract Sum.

l. Project Closeout:

1) Include separate line items for project closeout requirements, as follows:

a) Demobilization.
b) Warranties.
c) Final cleaning.
d) Operation and maintenance manuals.
e) Project record documents.
f) Demonstration and training.

2) The total value of all project closeout line items shall equal to not less than the following:

a) General Contract: Five percent (5%) of the Contract Sum.
b) Plumbing Contract: Five percent (5%) of the Contract Sum.
c) Mechanical Contract: Five percent (5%) of the Contract Sum.
d) Electrical Contract: Five percent (5%) of the Contract Sum.
e) Food Service Contract: Five percent (5%) of the Contract Sum.

6. Each item in the schedule of values shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications as certified by Architect and Construction Manager.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Construction Manager.

C. Application for Payment Forms: Use AIA Document G732 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.

1. Entries shall match data on the schedule of values.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received.
3. Include amounts of fully executed Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Enter in column F (Materials Presently Stored) of AIA Document G703 the value of materials presently stored for which payment is sought. Recalculate the total of the column at the end of each pay period. This value covers both materials newly stored for which payment is sought and materials previously stored which are not yet incorporated into the Project. Payment by the Owner for stored materials does not result in a deduction from this column. Only as materials are incorporated into the Project is their value deducted from this column and incorporated into column E (Work Completed--This Period.).

2. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

3. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Construction Manager.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule.
4. Certificates of insurance and insurance policies.
5. Performance and payment bonds.

H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited to, two originals and two copies each of the following:

1. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
2. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
3. AIA Document G707, "Consent of Surety to Final Payment."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

Attachments: Stored Materials Invoicing Documentation
Schedule of Values Example

END OF SECTION 01 29 00

TETRA TECH
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Stored Materials Invoicing Documentation

Project: _____

Project No.: _____ **Contract Type:** _____

Contractor: _____ **Subcontractor:** _____

Reason for Request:

_____

_____

Application for Payment No.: _____ **Date:** _____

1. **Material Identification**

Description: Quantity:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Provide Specific Location of Materials Stored:

_____

_____

_____

_____

_____

2. **Material Value** $ _____

☐ Attach an Invoice or Quantified Statement of Value.

3. **Certificate of Insurance**

☐ Attach a Certificate of Insurance for the above specified materials. Certificate shall name _____ (Name of District) as a loss payee with respect to the specified materials.

4. **Transfer of Title**

The Contractor hereby agrees to transfer complete ownership of all listed materials to _____ (Name of District) at the time payment is made to Contractor for the above referenced Application for Payment. The Contractor remains responsible for all contractual requirements for the above listed materials including complete installation and providing all warranties.

Signed Date

_____ _____

CONTINUATION SHEET AIA DOCUMENT G702 (Instructions on reverse side) Page 2 of 4 Pages

ATTACHMENT TO PAY APPLICATION APPLICATION NUMBER:

PROJECT: APPLICATION DATE:

Building SED #

A	B	C	D	E	F	G		H	I
Item No.	Description of Work	Scheduled Value	Work Completed		Materials Presently Stored (Not In D or E)	Total Completed And Stored To Date (D + E + F)	% (G/C)	Balance To Finish (C - G)	Retainage
			From Previous Application (D + E)	This Period					
1	Allowance Amount (Separate line item from all buildings)								
2	Bond								
3	Insurance								
4	Submittals (2%)								
5	Supervision (2%)								
6	Safety & Field Reports (1%)								
7	Coordination Drawings (2%)								
8	Meetings (2%)								
9	Test and Balance (3%)								
10	Punchlist (3%)								
11	**Project Closeout Items (5%)**								
12	Demobilization								
13	Warranties								
14	Final Clearing								
15	Operation & Maintenance Manuals								
16	Project Record Documents								
17	Demonstration & Training								
18	**Building Area (Refer to drawing Key Plan)**								
19	**List work related Specification Section Number (for example Div 03)**								
20	**List section title (for example Cast-in-Place Concrete)**								
21	Labor								
22	Material								
24	**Alternates No#**								
25	Labor								
26	Material								
27	**Change Orders**								
28	**CO #1**								
	Subtotal (for each page)								

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Digital data files.
3. Coordination drawings.
4. Owner's Project Representative activities.
5. Electronic form procedures.
6. Requests for Information (RFIs).
7. Project meetings.

1.3 COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation. 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.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Installation and removal of temporary facilities and controls.
3. Project meetings.
4. Project closeout activities.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.4 DIGITAL DATA FILES

A. Architect's Digital Data Files: Upon request, and at Architect's sole discretion, electronic copies of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.

1. Architect may furnish Contractor digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.

a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

b. Format: The Contract Drawings may be available in AutoCAD and .pdf formats.

1) Architect's charge for drawings in AutoCAD format: $50 per drawing.
2) Architect's charge for drawings in .pdf format: $50 per request.

c. Contractor shall fill out and submit a Request for Electronic Drawing Files form included in Project Manual for any drawing files.

d. Contractor shall also execute a Terms of Electronic File Transfer (TOFT) included in Project Manual for any drawing files furnished in AutoCAD format.

e. The following drawings may be furnished for the appropriate discipline:

1) Site base file drawings.
2) Floor plans.
3) Reflected ceiling plans.

1.5 PHOTOS

A. Photos submitted by the Contractor for any purpose related to the project must be submitted in JPEG format.

1.6 COORDINATION DRAWINGS

A. Each Contractor:

1. Participate in the Coordination Drawing process as required to ensure work is coordinated with associated Contractors to fulfill the scope and schedule of the project. Contractors with work in areas where more than one Contractor has Contract Work must participate in coordination process for that area of work.

2. Architect will furnish Contractor with digital media copies of architectural, structural, mechanical, plumbing, and electrical base information, not including drawing sheets or details, at no charge, upon providing Architect with a fully executed indemnification agreement.

3. At an initial coordination meeting scheduled by the Mechanical Contractor and Construction Manager and Architect in accordance with schedule defined in Division 01 Section Multiple Project Summary – Project Schedule, coordinate the schedule of the creation and revision of Coordination Drawings with the Architect, Construction Manager, Owner, and involved Contractors as required to meet the construction schedule.

4. Revise Coordination Drawings identifying work of applicable Contract that requires coordination with building systems or that presents potential interference with existing construction or construction provided by another Contractor. Examples of these components and work include (but are not limited to):

    a. Systems located above ceilings or integrated into ceiling system such as ducts, piping, lighting, cable trays, electrical conduits, joist cross bracing, structure, supports, fire protection systems, diffusers, grilles, access doors, etc.

    b. Components of systems installed on roofs requiring roof penetrations, structural support, lightning protection, etc.

    c. Components suspended or otherwise inside spaces such as gymnasium backstops, light fixtures, ducts, gymnasium dividers, web spaces of trusses with duct/pipe, etc.

    d. Clearances required for service access or by codes. Show service access locations including brief note such as “service access to filters”.

    e. Equipment located adjacent to building that may need coordination with landscaping such as dust collectors, transformers, gas metering stations, chillers and condensing units, pads, louvers, etc.

5. Resolution of Conflicts and Interferences:

   a. Schedule additional coordination meetings through Construction Manager with Architect, Owner, and other Contractors and attend additional coordination meetings as required to fully resolve conflicts and complete process.

   b. Review draft revisions of respective trades and Owner at subsequent coordination meetings with involved parties. Resolve conflicts and interferences at these meetings.

   c. Reposition proposed locations of components and equipment in applicable Contracts as required to resolve conflicts and address Owner's serviceability concerns after review of Coordination Drawings. For exposed work, adjust and coordinate configuration of components to achieve aesthetics consistent with the scope of the Project without increase in Contract Sum.

   d. Notify Construction Manager, Architect, Owner's Representative, and affected Contractors in case of unresolved interferences or conflicts prior to installation of construction. Schedule meetings and take other measures to resolve interferences or conflicts and revise applicable Coordination Drawings as required. Re-process revised Coordination Drawings in accordance with "Processing of Coordination Drawings" below to ensure all Contractors are aware of revisions in Coordination Drawings.

   e. When all conflicts have been resolved on each complete Coordination Drawing, each applicable Contractor shall digitally sign and date the drawings and deliver to the Mechanical Contractor for additional distribution. A copy of the signed originals will be stored in the Construction Manager's jobsite offices for reference for the duration of the construction.

   f. Each Contractor will be provided with a copy of each coordination drawing and may transcribe additional information from the copies stored in the Construction Manager's jobsite offices.

6. Do not proceed with work in Contract in each area until agreement is reached with all Contractors and the Construction Manager, Architect and Owner on exact arrangements for each room or area, unless otherwise directed by the Construction Manager, Architect or Owner.

   a. If Contractor proceeds prior to resolving conflicts and receiving above agreement or direction and conflicts ensue as a result, Contractor must modify installed construction as required to permit other Contractors to proceed with coordinated installation at no change in Contract Sum.

B. Mechanical Contract:

1. In accordance with the Coordination Drawing creation schedule agreed to as described above, prepare and distribute Coordination Drawings as specified in the Division 23 Sections "Common Work Results for HVAC" and "Ductwork", for all areas with any construction work, including indoor areas and rooms, roofs, and near building areas with mechanical equipment. Consider construction of other Contracts as shown in Contract Documents to avoid conflicts. Prepare and revise the Coordination Drawings in the order and within the schedule agreed upon.

2. Coordinate the scheduling of coordination meetings with the project schedule Construction Manager, involved Contractors, and Owner. Schedule the meetings at the agreed upon schedule.

3. Deliver two prints and one electronic file in format as required elsewhere and as agreed to at the initial coordination meeting, of each Coordination Drawing simultaneously to Construction Manager, Architect, Owner, and each Contractor listed below and obtain written dated receipts from other contractors. Include additional print copy and electronic copy to Electrical Contractor, to become "Complete Coordination Drawing" for subsequent distribution and complete final coordination documentation as described below. Submit copy of receipts to Architect and Construction Manager.

4. Duplicate and deliver final complete drawings as required by Division 23 Section "Ductwork."

C. Contractors other than Mechanical Contractor:

1. Obtain Coordination Drawings and prepare draft revisions to Coordination Drawings showing applicable work of respective Contract and indicating perceived conflicts, proposed resolution of conflicts with existing conditions and construction of other Contracts as shown in Coordination Drawings.

2. Revise the Coordination Drawings in the order and within the schedule agreed upon.

3. Obtain Complete Coordination Drawing prints and revise showing components and work of applicable Contract including resolution of conflicts with construction of other Contracts as agreed to and as shown on revised draft Coordination Drawings.

4. Processing of Coordination Drawings: Receive, revise, and deliver Complete Coordination Drawings initially prepared by Mechanical Contractor according to the following sequence as applicable to Project.

5. Each Contractor: Obtain written dated receipt from subsequent recipient of Complete Coordination Drawings and submit copy of receipts to Architect and Construction Manager:

    a. General Contract.
    b. Mechanical Contract.
    c. Electrical Contract.
    d. Plumbing Contract.

1.7 OWNER'S PROJECT REPRESENTATIVE ACTIVITIES

A. Project Representative shall:

1. Serve as liaison between Architect, Contractor[**s**] and Owner.

2. Perform on-site observations of the progress and quality of the Work as may be reasonably necessary to assist the Architect determine, in general, if the Work is being performed in a manner indicating that the Work when completed will be in conformance with the Contract Documents. Notify the Architect if, in the Project Representative's opinion, Work does not conform to the Contract Documents or requires special inspection or testing.

3. Monitor the Contractor's construction schedules on an ongoing basis and alert the Architect to conditions that may lead to delays in completion of the Work.

4. Coordinate shared access to work areas.

5. Coordinate and issue written approvals for acceptable interruptions of utilities and potentially disruptive activities.

6. Receive and review suggestions proposed by the Contractor, and submit them, together with recommendations, to the Architect.

7. Attend all meetings and report to the Architect on the proceedings.

8. Notify Architect when tests required by the Contract Documents and inspections by authorities having jurisdiction will be performed. Observe tests required by the Contract Documents and inspections by authorities having jurisdiction. Record and report to the Architect on test procedures, inspections, and results. Verify testing is performed in accordance with specified requirements and at appropriate times.

9. Maintain records at the construction site in an orderly manner, including correspondence, Contract Documents, Change Orders, Construction Change Directives, reports of meetings, Shop Drawings, Product Data and similar submittals; supplementary drawings, color schedules and requests for payment; and names, addresses telephone numbers, and email addresses of the Contractors, Subcontractors and principal material suppliers.

10. Maintain a daily log of activities at the site, including weather conditions, nature and location of Work being performed, verbal instructions and interpretations given to the Contractor, and specific observations. Record any occurrence or Work that might result in a claim for a change in Contract Sum or Contract Time. Maintain a list of visitors, their titles, and time and purpose of their visit.

11. Notify the Architect if any portion of the Work requiring Shop Drawings, Product Data or Samples is commenced before such submittals have been approved by the Architect. Receive and log Samples required at the site, notify the Architect when they are ready for examination, record the Architect's action and maintain custody of approved Samples.

12. Review the Contractor's record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications at intervals appropriate to the stage of construction and notify the Architect of any apparent failure by the Contractor to maintain up-to-date records.

13. Review Applications for Payment and forward to the Architect with recommendations for disposition.

14. Assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion.

15. Assist the Architect in receipt and transmittal to the Owner of documentation required of the Contractor at completion of the Work.

B. Project Representative shall not:

1. Authorize deviations from the Contract Documents.

2. Approve submittals or substitute materials or equipment.

3. Personally conduct or participate in tests or third-party inspections.

4. Assume any of the responsibilities of the Contractor's superintendent or of Subcontractors.

5. Expedite the Work for the Contractor.

6. Have control over or charge of or be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work.

7. Authorize or suggest that the Owner occupy the Project in whole or in part.

1.8 ELECTRONIC PROCEDURES

A. Use Submittal Exchange for the following processes:

1. Submittals, refer to Division 01 “Submittal Procedures”.
2. Request for Information (RFI).
3. Architect’s Supplemental Instruction (ASI), refer to Division 01 Section “Contract Modification Procedures”.
4. Proposal Request (PR), refer to Division 01 Section “Contract Modification Procedures”.
5. Change Order (CO), refer to Division 01 Section “Contract Modification Procedures”.
6. Contractor Quotes, refer to Division 01 Section “Contract Modification Procedures”.
7. Allowance Access Authorization (AAA), refer to Division 01 Section “Contract Modification Procedures
8. Payment Applications, refer to Division 01 Section “Payment Procedures”.
9. Inspection Reports.

B. Contractor and other parties granted access by the Architect to Submittal Exchange shall follow instructions issued by the Architect during the preconstruction conference.

1.9 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified, via the electronic form procedures outlined.

1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of others.

B. Content of the RFI: Include a detailed description of item needing information or interpretation and the following:

1. Project number.

2. RFI number.

3. Contract number and title.

4. Name of Contractor.

5. Name of Contractor’s contact person.

6. Email address of Contractor’s contact person.

7. RFI subject.

8. Question: Fully describe question or information requested. Include:

    a. Specification Section number and title and related paragraphs, as appropriate.
    b. Drawing number and detail references, as appropriate.
    c. Field dimensions and conditions, as appropriate.
    d. Contractor's suggested resolution. If Contractor's solution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

9. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow reasonable time for Architect's response for each RFI.

1. The following RFIs will be returned without action:

   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within seven days of receipt of the RFI response.

D. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

E. Electronic RFI Log: Architect will maintain a tabular log of RFIs organized by RFI number.

1.10 PROJECT MEETINGS

A. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager and Architect, but no later than 15 days after date of Notice of Award.

1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Designation of key personnel and their duties.
   b. Lines of communications.
   c. Bonds and insurance.
   d. Subcontract list.
   e. Schedule of values.
   f. Payment request estimate.
   g. Applications for Payment.

h. Contractor's construction schedule.
i. Submittals.
j. Electronic form procedures (RFIs, ASIs, PRs).
k. Procedures for processing Change Orders and Construction Change Directives.
l. Quality control.
m. Project schedule.
n. Contractor review of Contract Documents, including Drawings and Specifications.
o. Project meetings.
p. Project closeout procedures.
q. Electronic drawings.
r. AIA and Word documents.

3. Report: Construction Manager will prepare and distribute meeting report.

B. Site Preconstruction Conference: Construction Manager will schedule and conduct a site preconstruction conference, at a time convenient to Owner, Construction Manager and Architect.

1. Attendees: Authorized representatives of Owner, Owner's testing agency, Construction Manager, Architect, and their consultants; Geotechnical Engineer of Record; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance, including the following:

a. Designation of key personnel and their duties.
b. Lines of communication.
c. Electronic form procedures (RFIs, ASIs, PRs).
d. Submittal procedures.
e. Subcontracts.
f. Construction schedule.
g. Temporary facilities and controls.
h. Use of premises.
i. Permits.
j. Soil erosion and sediment control.
k. Tree protection.
l. Procedures for testing and inspecting.
m. Roles and responsibilities of each party.
n. Topsoil.
o. Seeding/sodding.
p. Planting.
q. Concrete.
r. Retaining walls.
s. Planting islands.
t. Railings.
u. Staging removal.
v. Track/synthetic turf.

3. Report: Construction Manager will prepare and distribute meeting report.

C. Structural Preconstruction Conference: Construction Manager will schedule and conduct a structural preconstruction conference, at a time convenient to Owner, Construction Manager and Architect.

1. Attendees: Authorized representatives of Owner, Owner's testing agency, Construction Manager, Architect, and their consultants; Geotechnical Engineer of Record; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance, including the following:

   a. Procedures for testing and inspecting.
   b. Submittals.
   c. Testing, placing, curing and finishing structural concrete.
   d. Hot/cold weather concrete construction.
   e. Fabrication and erection of structural steel.
   f. Attaching metal floor and roof deck, as applicable.
   g. Procedures for constructing composite slabs, as applicable.
   h. Procedures for unit masonry control joints, grouting, and workmanship.
   i. Hot/cold weather masonry construction.
   j. Cold formed metal framing.
   k. Roles of each party regarding the above work items.

3. Report: Construction Manager will prepare and distribute meeting report.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Review each Specification Section for requirements for preinstallation conferences.

   a. No later than 15 days after date of Notice of Award, submit to Architect complete listing of preinstallation conferences to be held.

2. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.

3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

   a. Contract Documents.
   b. Deliveries.
   c. Submittals.
   d. Review of mockups.
   e. Time schedules.
   f. Weather limitations.
   g. Manufacturer's written instructions.
   h. Warranty requirements.
   i. Compatibility of materials.

j. Acceptability of substrates.
k. Temporary facilities and controls.
l. Space and access limitations.
m. Testing and inspecting requirements.
n. Installation procedures.
o. Coordination with other work.
p. Required performance results.
q. Protection of adjacent work.

4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

5. Reporting: Distribute report of the meeting to each party present and to other parties requiring information.

6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Slab Pre-Pour Conference: Construction Manager will schedule and conduct a slab pre-pour conference, at a time convenient to Owner, Construction Manager and Architect, but no later than seven days before the first slab pour.

1. Attendees: Authorized representatives of Owner, Owner's testing agency, Construction Manager, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance, including the following:

a. Schedule.
b. Procedures for testing and inspecting.
c. Procedures for sub-base preparation.
d. Concrete mix designs.
e. Concrete delivery.
f. Placing, curing, finishing, and protecting concrete.
g. Slab joints.
h. Slab flatness and levelness.

3. Report: Construction Manager will prepare and distribute meeting report.

F. Progress Meetings: Construction Manager will conduct progress meetings at regular intervals, unless otherwise necessitated.

1. Attendees: In addition to representatives of Owner , Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review report of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Review present and future needs of each entity present, including the following:

        1) Report of progress since previous meeting.

        2) Architect/Engineer discussion items.

        3) Status of ASIs, PRs, Change Orders.

        4) Status of submittals.

        5) Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule.

            a) Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

            b) Review schedule for next period.

        6) Date of Substantial Completion.

        7) Status of RFIs.

        8) Owner discussion items.

        9) Discussion items for each Contract.

        10) General and administrative items, including such items as:

            a) Project documentation.
            b) Prohibitions.
            c) Identification cards.
            d) Separation.
            e) Egress.
            f) Conservation.

3. Report: Construction Manager will prepare and distribute the meeting report to each party present and to parties requiring information.

G. Project Closeout Conference: Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner, Construction Manager and Architect, but no later than 90 days prior to each scheduled date of Substantial Completion.

1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for preparing operations and maintenance data.
    e. Requirements for delivery of material samples, attic stock, and spare parts.
    f. Requirements for demonstration and training.
    g. Owner's occupancy requirements.
    h. Responsibility for removing temporary facilities and controls.

3. Report: Construction Manager will prepare and distribute meeting report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

Attachments: Request for Electronic Drawing Files
Terms of Electronic File Transfer (TOFT)

END OF SECTION 01 31 00

TETRA TECH
ARCHITECTS & ENGINEERS

Cornell Business + Technology Park
10 Brown Road
Ithaca, New York 14850
Tel. (607) 277-7100
Fax (607) 277-1410

Request for Electronic Drawing Files – Business Office

Prime Contractor Name:

Prime Contractor Address:

Contact to Receive Invoice:

Project Name:

Project Number:

Project Manager:

Drawing Type: Some drawings may be only available as a PDF file and may NOT be available as an AutoCAD file.

☐ PDF Files ($50 per request) ☐ AutoCAD type files ($50 per file)

For PDF files:

List each Drawing # Requested – If requesting entire set note "All".

For AutoCAD files:

Number of drawing files

List each Drawing # Requested

Contractor Signature _____

TETRA TECH
ARCHITECTS & ENGINEERS

Cornell Business + Technology Park
10 Brown Road
Ithaca, New York 14850
Tel. (607) 277-7100
Fax (607) 277-1410

Terms of Electronic File Transfer (TOFT)

The purpose of this document is to establish the terms of use and liability related to the electronic transfer of files from Tetra Tech Engineers, Architects & Landscape Architects, P.C. d/b/a Tetra Tech Architects & Engineers (hereinafter "Tetra Tech") to the Recipient (designated below). This Agreement covers all electronic files transmitted to the Recipient, associated with the Project(s) listed below, that are not otherwise covered by a contractual agreement to provide such files.

Project(s) & Project #s: _____

_____

Recipient of Electronic Files:

Company Name: _____

Company Address: _____

_____

Terms of Electronic File Transfer:

1. The electronic files (Files) furnished by Tetra Tech to the person or entity receiving the Files (Recipient) are provided only for the convenience of the Recipient, and only for its sole use. RECIPIENT AGREES THAT, BY OPENING THE PACKAGE CONTAINING THE FILES, RECIPIENT SHALL BE BOUND BY AND SUBJECT TO THE TERMS OF THIS DISCLAIMER.

2. Recipient recognizes that the Files may not be adequate or appropriate for Recipient's needs. In the case of any defects in the Files or any discrepancies between the Files and the hardcopy of the Files bearing the seal of Tetra Tech's professional registrant (if applicable), the sealed hardcopy shall govern. Recipient accepts the Files on an "as-is" basis, with any and all faults. There are no express warranties made by Tetra Tech with respect to the Files, and any implied warranties are excluded.

3. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. Tetra Tech assumes no responsibility for the accuracy or completeness of the Files, and any use or reuse of such electronic data for any purpose shall be at the Recipient's sole risk.

4. Furthermore, in consideration of the use of the electronic data and the Files, Recipient agrees, to the fullest extent permitted by law, to defend (by legal counsel selected by Tetra Tech), indemnify, and hold Tetra Tech harmless from any and all claims, damages, losses, costs, and expenses, including attorney's fees and court costs (including the costs of any appeals) arising out of or resulting from Recipient's use, reuse, or use by others, regardless of whether such claims, damages, losses, costs, and expenses are caused in whole or in part by Tetra Tech. The duty to defend, indemnify, and hold Tetra Tech harmless shall apply regardless of whether such claims, damages, losses, costs, and expenses arise out of causes of action for tort, including negligence, contract, warranty, or strict liability.

5. The Recipient agrees to the following use restrictions of the electronic files:

a. The use of these files is limited only to the operation and maintenance of the above referenced project(s).

_____

6. By signing below, the Recipient accepts full responsibility for the use of all electronic files received from and/or produced by Tetra Tech for the Project(s) listed above and any documents, instructions, or otherwise produced there from by the Recipient along with all Terms of Electronic Transfer indicated herein. A copy of this Agreement, executed by Tetra Tech, will be provided before or with the first electronic file transmittal.

Signature	Type or Print Name	Title	Date
_____	_____	_____	_____

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Reports.

1.3 INFORMATIONAL SUBMITTALS

A. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period. Follow format outlined in attachment at end of this Section.
B. Site Condition Reports: Submit at time of discovery of differing conditions.
C. Special Reports: Submit at time of unusual event.

1.4 COORDINATION

A. Secure time commitments for performing critical elements of the Work from entities involved.
B. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.5 CONTRACTOR’S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.
B. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

1.6 CONTRACTOR’S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, horizontal, Gantt-chart-type, Contractor's construction schedule per requirements of Division 01 Section “Multiple Contract Project Summary – Project Schedule”.

1. Format: Refer to accompanying “Format for Construction Schedule.”

B. Preparation: Indicate each significant construction activity separately, by Specification Section, coordinated with the schedule of values. Provide line item(s) for each Specification Section.

C. Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities.

D. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties with a need-to-know schedule responsibility.

1. When revisions are made, distribute updated schedules to the same parties.

1.7 REPORTS

A. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

B. Special Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information.

PART 2 - PRODUCTS (Not Used)

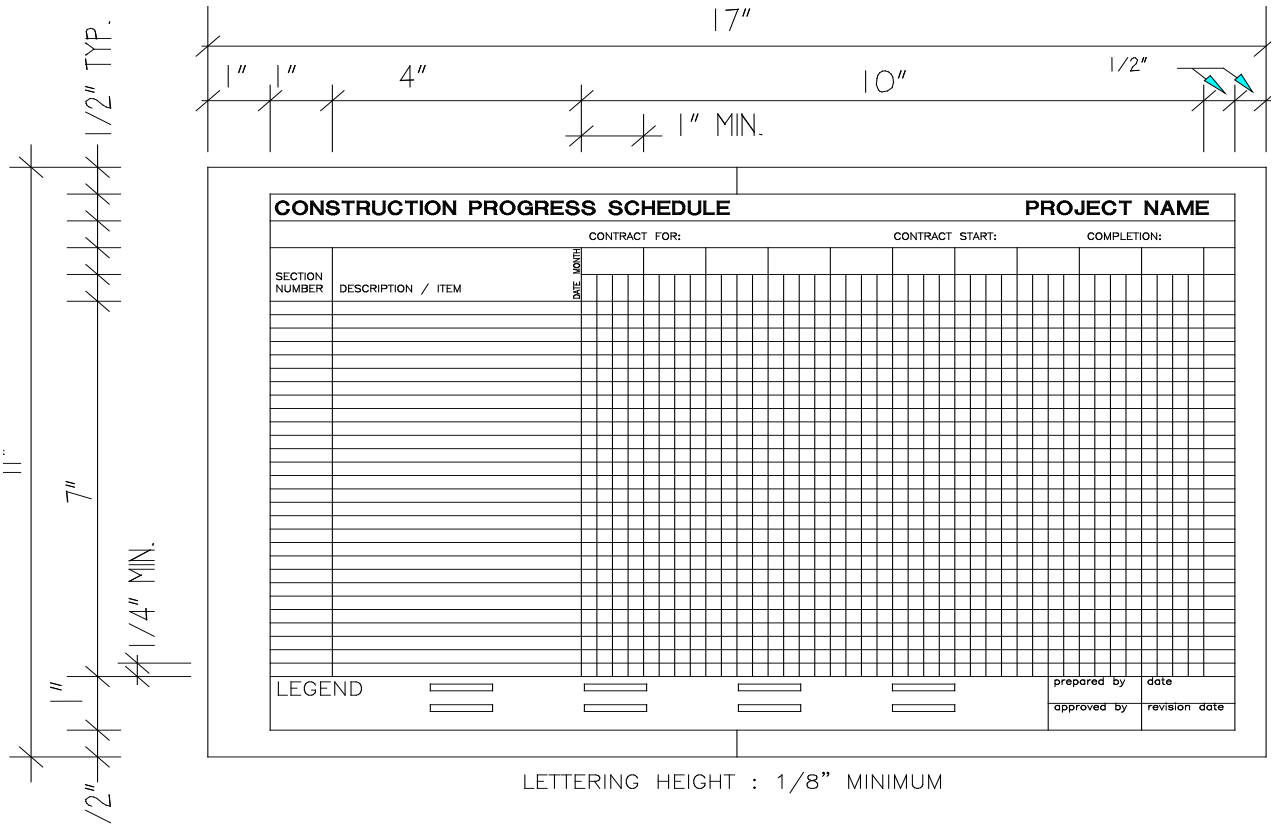
PART 3 - EXECUTION (Not Used)

Attachment: Format for Construction Schedule

END OF SECTION 01 32 00

SECTION 01 32 00 - PROJECT SCHEDULE - Attachment #1

FORMAT FOR
CONSTRUCTION SCHEDULE



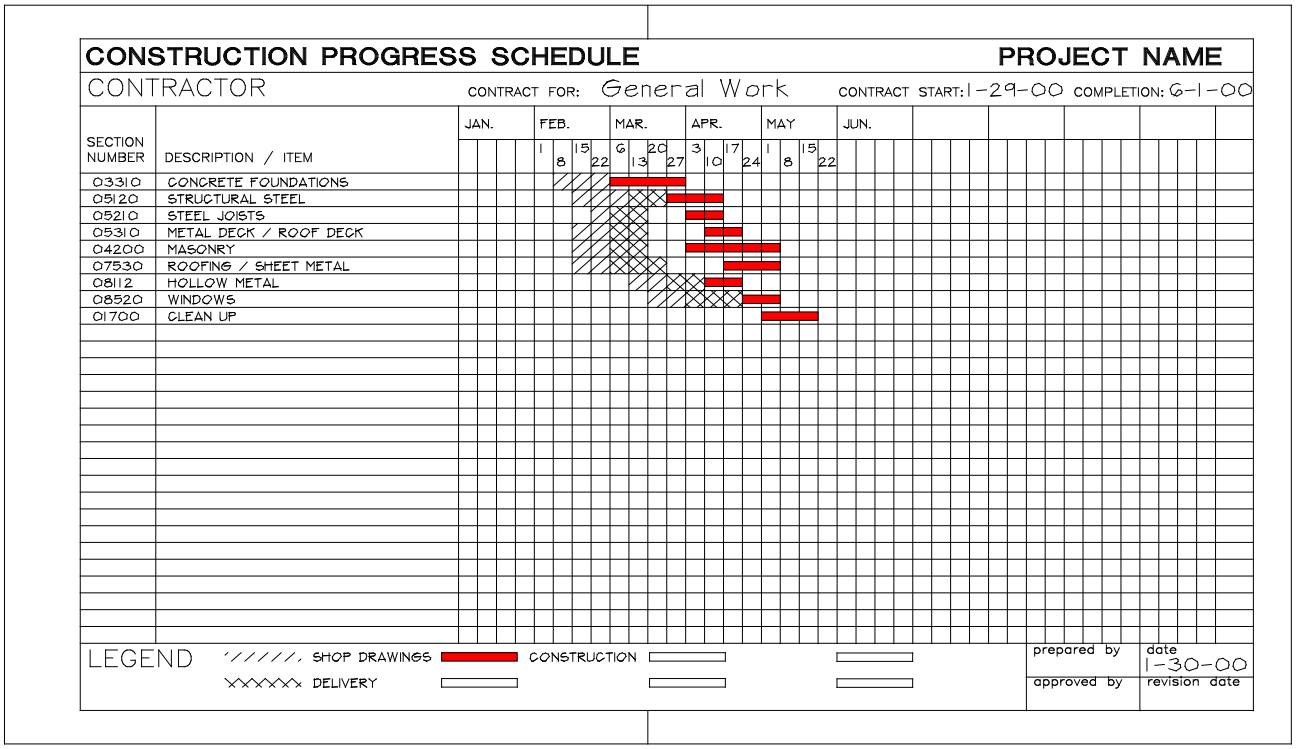
Format

Provide separate bar for each item in sequential order from beginning of Project to completion with the following information included for each item:

Related Technical Specification number.
Distinct graphic delineation, indicating area of building where schedule item in located.
Shop drawing submittal date and required acceptance date.
Product procurement date and anticipated delivery date.
Projected start and completion dates for each item.

SECTION 01 32 00 - PROJECT SCHEDULE - Attachment #1

FORMAT FOR
CONSTRUCTION SCHEDULE



Sample

Provide separate bar for each item in sequential order from beginning of Project to completion with the following information included for each item:

Related Technical Specification number.
Distinct graphic delineation, indicating area of building where schedule item in located.
Shop drawing submittal date and required acceptance date.
Product procurement date and anticipated delivery date.
Projected start and completion dates for each item.

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1. Process designated submittals for the Project electronically through designated Electronic Submittal System. PDF files must be opened, viewed, modified and printed using Adobe Acrobat PDF software to view reviewer comments/stamps.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. As-Specified Products: Products to be incorporated into Project as specified by manufacturer name and product designation and including all options in Part 2 of technical specifications, intended to be installed as specified in Part 3 of technical specifications, and from a product category specifically identified as eligible to be considered as an “as-specified product” in the Action Submittals Article in Part 1 of technical specifications.

C. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager’s responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

E. Electronic Submittal System: A method to transmit certain electronic submittals between the Contractor, Construction Manager, Architect, and Owner, using Submittal Exchange website service.

1. For consistency, the standard file format will be PDF. Convert paper originals and other file formats to PDF prior to submission.

2. In the event of system malfunction, process submittals in accordance with the Architect’s instructions, until the system malfunction has been corrected.

3. For this Project, process the following submittal types through the designated electronic submittal system:

    a. Product Data.
    b. Sustainable Design Submittals.
    c. Shop Drawings.
    d. Product Schedules.
    e. Qualification Data.
    f. Certificates (Welding, Installer, Manufacturer, Product, and Material, as applicable).
    g. Test Reports (Material, Product, Preconstruction, Compatibility, and Field, as applicable).
    h. Research Reports.
    i. Warranty (sample).
    j. Design Data, including calculations.
    k. Coordination Drawings.

4. For Samples, provide electronic submittal of Sample cover sheet, identifying location and actual delivery date of Samples. Deliver Samples to location (Architect's office, Project site, etc.) as directed by the Architect.

1.4 COLOR SCHEDULE

A. Color Schedule: Within 30 days after date of Notice of Award, submit a complete list of proposed manufacturers and complete product designations (i.e. model, grade, series, product line, etc.) for each item requiring color selection by Architect.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Where indicated, submit all submittal items required for each Specification Section concurrently.

3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow sufficient time for submittal review, including time for resubmittals. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Include a cover sheet on each submittal item for identification. Do not combine different submittals under same cover sheet; only one submittal is to be provided per email.

   a. Cover Sheet Form: Use PDF version of sample form included in Project Manual. Complete each item on form, sign and date. Architect will furnish PDF version of sample form.

2. Name submittal file as directed by Architect.

3. Transmit each submittal via Electronic Submittal System.

4. Transmit each submittal to Architect using the Submittal Exchange website www.submittalexchange.com.

D. Resubmittals: Make resubmittals in same form and, for non-electronic submittals, in the same number of copies as initial submittal.

1. Note date and content of revision in label or title block and clearly indicate extent of revision.

2. Resubmit submittals until they are marked with approval notation from Architect and Construction Manager.

3. Refer to the General Conditions for provisions allowing Owner to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of certain resubmittals.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.

F. Use for Construction: Retain complete electronic copies of submittals on Project site during Construction. Also maintain one complete set of hard paper copies of all approved submittals on Project site during Construction. Use only final action submittals that are marked with approval notation from Architect and Construction Manager.

G. Use of As-Specified Verification Form: The As-Specified Verification Form is intended to reduce certain action submittal paperwork for select products to be incorporated into the Work. If product to be incorporated into Project is specified by name and product designation in Part 2 of the Technical Specification Section and is from a product category specifically identified as eligible to be considered as an “as-specified product” in the Action Submittals Article in Part 1 of technical specifications, submit “As-Specified Verification Form” attached to this Specification Section.

1.6 ENVIRONMENTAL REQUIREMENTS

A. All products provided for use in construction of this Project are to be free of asbestos. Refer to Division 01 Section "Closeout Procedures" for certification required to be provided. The Owner may provide random testing of installed products/ construction for asbestos content. Any Contractor-installed product found to contain asbestos shall be classified as defective work. Defective work shall be corrected by the Contractor as specified in the General Conditions.

1.7 SUBMITTAL PROCEDURES, GENERAL

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1.8 ELECTRONIC SUBMITTAL REQUIREMENTS

A. Use the designated electronic submittal system for submittals in this Article.

1. Review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.

2. Transmit each submittal to Construction Manager and Architect using the Submittal Exchange website, www.submittalexchange.com.

3. For Action Submittals, Architect / Engineer and Construction Manager review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review.

4. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.

5. After award of contract, training will be provided by Submittal Exchange regarding use of website and PDF submittals. Contact Submittal Exchange at 1-800-714-0024.

6. Internet Service and Equipment Requirements:

    a. Email address and Internet access at Contractor's main office.
    b. Adobe Acrobat (www.adobe.com), for applying electronic stamps and comments.

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

8. Retain one electronic copy of all approved submittals, as part of the project records required at Project Closeout.

9. Tetra Tech Architects and Engineers will be the Submittal Exchange Project Leader and Subscriber.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. Mark submittal to show which products and options are applicable.

2. Include the following information, as applicable:

   a. Manufacturer's catalog cuts.
   b. Statement of compliance with specified referenced standards.
   c. Testing by recognized testing agency.

3. For equipment, include the following in addition to the above, as applicable:

   a. Printed performance curves.
   b. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

C. As-Specified Submittals: Complete the “As-Specified Verification Form”.

1. Refer to the Action Submittals Article of technical specification sections. If the product to be incorporated into the Project is an “as-specified product” as defined in this Section, then submit “As-Specified Verification Form” in lieu of Product Data, otherwise submit full Product Data.

2. Do not use “As-Specified Verification Form” unless specifically indicated in technical specification.

3. The “As-Specified Verification Form” alone serves as the submittal for the specific product and no additional action submittal data is due at the time of the submittal. The full specific product technical data, however, is required to be included in the Operation and Maintenance Manual. Comply with requirements specified in Division 01 Section “Operation and Maintenance Data”.

D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of dimensions established by field measurement.
   e. Relationship and attachment to adjoining construction clearly indicated.
   f. Seal and signature of professional engineer if specified.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

G. Certificates:

1. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS or ASME forms as applicable. Include names of firms and personnel certified.

2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

4. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

5. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

H. Test Reports:

1. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

2. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

3. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

4. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

5. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

I. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

J. Warranty: Submit sample warranties as required in individual Specification Sections.

K. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

L. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

1.9 SUBMITTAL REQUIREMENTS FOR COMMISSIONING

A. Provide the Commissioning Authority with a copy of all submittals for equipment to be commissioned.

1. The Commissioning Authority will review and approve Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the Architect’s review.

B. Data for Commissioning:

1. Refer to the technical Division Commissioning Section for listing of systems to be commissioned. Provide specific information needed about each piece of commissioned equipment or system in submittal as required to facilitate commissioning. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. 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 for pre-functional testing shall be submitted to the Commissioning Authority.

2. The Commissioning Authority may request further documentation necessary for the commissioning process. This data request may be made prior to submittals, during review, or subsequently as additional requirements become evident.

3. Much of this information is contained in the regular Operation and Maintenance (O&M) manual submittals normally submitted in the Project. For commissioned projects, this information is typically required prior to the regular formal O&M manual submittals and will be duplicated therein, facilitating the later creation of the O&M manual.

C. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Commissioning Authority's review.

1.10 NON-ELECTRONIC SUBMITTAL REQUIREMENTS

A. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Deliver one set to Architect's office, deliver the other set to the construction trailer at the job site.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit two sets of Samples. Deliver one set to Architect's office, deliver the other set to the construction trailer at the job site.

1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

B. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.

3. Submit subcontract list in the following format:

a. Number of Copies: Four paper copies of subcontractor list, unless otherwise indicated. Architect will return one copy.

C. List of Key Personnel Names: No later than 15 days after date of Notice of Award, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site.

1. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including emergency, office, and cellular telephone numbers and email addresses.

a. Number of Copies: Four paper copies of key personnel list, unless otherwise indicated.

1.11 MISCELLANEOUS SUBMITTAL REQUIREMENTS

A. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

B. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

1.12 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Identify any deviations from Contract Document requirements. Mark cover sheet with approval before submitting to Architect and Construction Manager.

1. Sign and date statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

2. If using Adobe Acrobat to electronically sign the Submittal Cover Sheet do not use the Certify Sign, Time Stamp feature as this will lock the document for further editing.

1.13 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

A. General: Architect and Construction Manager will not review submittals that do not bear Contractor's approval and will return them without action.

B. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and Construction Manager will mark submittal appropriately to indicate action, as follows:

1. Final Unrestricted Release: Where the submittal is marked "Approved," the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

2. Final-but-Restricted Release: Where the submittal is marked "Approved As Noted," the Work covered by the submittal may proceed provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.

3. Rejected: Where the submittal is marked "Rejected," do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.

4. Incomplete - Resubmit: Where the submittal is marked "Incomplete, Submit Additional Information," do not proceed with the Work covered by the submittal. Prepare additional information requested, or required by the Contract Documents, that indicates compliance with requirements, and resubmit.

C. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it or will return it if it does not comply with requirements.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Limit information submitted to specific products indicated. Do not submit extraneous matter. Submittals containing excessive extraneous matter will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may be returned by the Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

Attachments: Tt Cover Sheet
As-Specified Verification Form
Tt Cover Sheet for Closeout Submittals (Sections 01 78 23 and 01 78 39)

END OF SECTION 01 33 00

CONTRACTOR: _____ **SUBMITTAL DATE** ____/____/____

_____

Check following as applicable:

ARCHITECT: Tetra Tech Architects & Engineers

☐ First Submission

☐ Re-Submission No. ____

PROJECT IDENTIFICATION

Architect's
Project No.: 339070-25002

Proj. Name: Additions & Alterations to Elm Street Elementary School

Location: Waverly NY

PRODUCT IDENTIFICATION

Specification Section No. _____

Name of Product: _____

_____

Name of Manufacturer: _____

SUBCONTRACTOR

_____

SUPPLIER

_____

RELATIONSHIP TO STRUCTURE

Building
Name _____

_____
(Room #) *(Room Name)*

Contract Drawing No.: _____

RESERVED FOR USE BY TETRA TECH

ACTION SUBMITTAL:

☐ Approved

☐ Approved As Noted

☐ Rejected

☐ Incomplete, Submit Additional Information

INFORMATIONAL SUBMITTAL:

☐ No Action Taken

☐ Returned for Resubmittal

Reviewed By: _____

Date: _____

Reviewed only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review 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. Review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures.

DEVIATION FROM CONTRACT DOCUMENTS: _____

_____

CONTRACTOR COMMENTS: _____

_____

ARCHITECT'S COMMENTS: _____

_____

CONTRACTOR'S STAMP

CONTRACTOR'S CERTIFICATION
I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONTRACTOR IN ACCORDANCE WITH THE GENERAL CONDITIONS. PRODUCTS/MATERIALS ARE FREE OF ASBESTOS AS REQUIRED BY THE CONTRACT DOCUMENTS.

BY _____

CONSTRUCTION MANAGER'S CERTIFICATION
I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONSTRUCTION MANAGER IN ACCORDANCE WITH THE GENERAL CONDITIONS.

BY _____

CM Submittal No. _____

TETRA TECH
ARCHITECTS & ENGINEERS

As-Specified Verification Form

Project Number: 339070-25002

Project Title: Additions & Alterations to Elm Street Elementary School

Technical Specification Section: _____
(Include Section Number and Title as shown in Project Manual)

Specified Product: _____
(Include manufacturer's name and product designation)

The undersigned, hereinafter called the Contractor, hereby warrants that the Specified Product listed above will be incorporated into the Project in accordance with requirements specified in the Technical Specification Section identified above without modification or alteration.

By acceptance of this form, Tetra Tech Architects & Engineers (hereinafter called Tetra Tech), agrees that limited submittals identified in the Technical Specification Section identified above are not required, unless otherwise stated in the Submittals article in the Technical Specification Section.

The Contractor is advised that use of this As-Specified Verification Form does not relieve the Contractor from providing remaining submittal documentation required in Technical Specification sections and all information required in Division 1 Closeout section of the Project Manual or from complying with requirements of the General Conditions.

Products/Materials are free of asbestos as required by the Contract Documents.

_____
(Name of Contractor)

_____
(Authorized Signature)

_____
(Title of Signatory)

_____
(Date)

RESERVED FOR USE BY TETRA TECH

ACTION SUBMITTAL:

☐ Approved / Approved As Noted

☐ Rejected

Reviewed By: _____

Date: _____

Reviewed only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review 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. Review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures.

ARCHITECT'S COMMENTS: _____

CONTRACTOR: _____ **SUBMITTAL DATE** ____/____/____

_____

Check following as applicable:

☐ First Submission ____

ARCHITECT: Tetra Tech Architects & Engineers

☐ Re-Submission No. ____

PROJECT IDENTIFICATION

Architect's
Project No.: 339070-25002

Proj. Name: Additions & Alterations to Elm Street Elementary School

Location: Waverly NY

PRODUCT IDENTIFICATION

Specification Section No. **01 78 23 OR 01 78 39** *(circle correct one)*

Name of Product: _____

_____

Name of Manufacturer: _____

SUBCONTRACTOR: _____

SUPPLIER: _____

RESERVED FOR USE BY TETRA TECH

INFORMATIONAL SUBMITTAL:

☐ No Action Taken

☐ Returned for Resubmittal

Reviewed By: _____

Date: _____

Reviewed only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review 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. Review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures.

DEVIATION FROM CONTRACT DOCUMENTS: _____

_____

CONTRACTOR COMMENTS: _____

_____

CONSTRUCTION MANAGER'S COMMENTS: _____

_____

ARCHITECT'S COMMENTS: _____

_____

CONTRACTOR'S STAMP

CONTRACTOR'S CERTIFICATION

I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONTRACTOR IN ACCORDANCE WITH THE GENERAL CONDITIONS. PRODUCTS/MATERIALS ARE FREE OF ASBESTOS AS REQUIRED BY THE CONTRACT DOCUMENTS.

BY _____

CONSTRUCTION MANAGER'S CERTIFICATION

I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED BY THE CONSTRUCTION MANAGER IN ACCORDANCE WITH THE GENERAL CONDITIONS. AND IN ACCORDANCE WITH THE CONSTRUCTION MANAGER'S CONTRACTUAL OBLIGATIONS WITH THE OWNER.

Approved _____ Rejected_____

BY _____

CM Submittal No. _____

SECTION 01 35 26 – GOVERNMENTAL SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Safety requirements included in 8 NYCRR 155.5 Uniform Safety Standards for School Construction and Maintenance Projects.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Provide all measures, including (but not limited to) materials, equipment, and procedures, required to comply with following requirements of 8 NYCRR 155.5 Uniform Safety Standards for School Construction and Maintenance Projects.

B. Certificate of Occupancy:

1. 8 NYCRR 155.5 (a): "The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy."

C. General Safety and Security Standards for Construction Projects:

1. 8 NYCRR 155.5 (e)(1): "All construction materials shall be stored in a safe and secure manner."

2. 8 NYCRR 155.5 (e)(2): "Fences around construction supplies or debris shall be maintained."

3. 8 NYCRR 155.5 (e)(3): "Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry."

4. 8 NYCRR 155.5 (e)(4): "During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry."

5. 8 NYCRR 155.5 (e)(5): "Workers shall be required to wear photo identification badges at all times for identification and security purposes while working at occupied sites."

D. Separation of Construction Areas from Occupied Spaces:

1. 8 NYCRR 155.5 (f): "Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used 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."

2. 8 NYCRR 155.5 (f)(1): "A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff."

E. Cleaning Occupied Areas:

1. 8 NYCRR 155.5 (f)(2): "Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building."

2. 8 NYCRR 155.5 (f)(3): "All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session."

F. Exiting and Ventilation:

1. 8 NYCRR 155.5(g): Maintain exiting and ventilation during school construction projects.
2. 8 NYCRR 155.5(g)(1): "Required exits, temporary stairs, ramps, exit signs, and door hardware shall be provided at all times."
3. 8 NYCRR 155.5(g)(2): "Required ventilation to occupied spaces affected by construction will be maintained during the project."

G. Noise Control:

1. 8 NYCRR 155.5 (i): "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."

H. Control of Fumes, Gases and Contaminants:

1. 8 NYCRR 155.5 (j): The contractor shall be responsible for the control of chemical fumes, gases, and other contaminants produced by welding, gasoline or diesel engines, roofing, paving, painting, and other fumes to ensure they do not enter occupied portions of the building or air intakes.

I. “Off-Gassing” of Volatile Organic Compounds:

1. 8 NYCRR 155.5 (j)(1): The contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paint, furniture, carpeting, wall coverings, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturer’s recommendations before a space can be occupied.

J. Asbestos Isolation:

1. 8 NYCRR 155.5 (k): “Large and small asbestos abatement projects as defined by 12 NYCRR 56 shall not be performed while the building is occupied.” Note, it is NYSED’s interpretation that the term "building", as referenced in this section of 8 NYCRR 155.5, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier.

2. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.

K. Lead and Asbestos Testing:

1. 8 NYCRR 155.5 (c)(1): “All school areas to be disturbed during renovation or demolition shall be tested for lead and asbestos.”

a. Asbestos and Asbestos-Containing Materials:

1) Be advised that asbestos and asbestos-containing materials are required to be abated as part of this Project. Refer to Division 02 Section “Asbestos Abatement”.

a) The extent of asbestos to be abated as part of the Project is indicated on Drawings included in the Contract Documents.

b) Prior to beginning Work, review Owner’s “Asbestos Management Plan” to ensure asbestos or asbestos-containing materials identified in that document are not disturbed.

2) Be advised that if materials suspected to be asbestos, or to contain asbestos, that are not included in the Project and not identified in the Contract Documents are encountered during construction, immediately notify Owner and take precautions as required to avoid disturbing materials until directed by Owner.

3) Transmission Electron Microscopy (TEM): All asbestos abatement work that requires clearance air sampling in accordance with New York State Industrial Code Rule 56 shall have clearance air samples collected and analyzed using Transmission Electron Microscopy as per the Asbestos Hazard Emergency Response Act (40 CFR 763). Refer to Division 02 Section "Asbestos Abatement".

b. Lead and Lead-Containing Materials:

1) Be advised that a lead inspection has been performed as required by New York State Education Department and a copy of the lead inspection report is available at the Owner's offices.

L. Code Rule 56:

1. 8 NYCRR 155.5(k): "All asbestos abatement projects shall comply with all applicable Federal and State laws including but not limited to the New York State Department of Labor industrial code rule 56 (12 NYCRR 56), and the Federal Asbestos Hazard Emergency Response Act (AHERA), 40 CFR part 763 (Code of Federal Regulations, 1998 Edition, Superintendent of Public Documents, U.S. Government Printing Office, Washington, DC 20402; 1998; available at the Office of Facilities Planning, Education Building Annex, Room 360, State Education Department, Albany, NY 12234."

M. Lead:

1. 8 NYCRR 155.5 (l): Surfaces that will be disturbed by reconstruction must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

a. Be advised that disturbance of lead and lead-containing materials is not anticipated as part of this Project.

b. Contractor is responsible for complying with requirements of all applicable federal, state and local regulations, including (but not limited to) OSHA Lead in Construction Standard 29 CFR 1926.62, when construction activities involve disturbance of materials containing 1.0 mg/sq cm or 0.5 percent of lead or less, including (but not limited to) lead-based paint, ceramic tile, and similar materials.

c. If materials suspected to contain lead above 1.0 mg/sq cm or above 0.5 percent that are not included in Project or identified in Contract Documents are encountered during construction, immediately notify Owner and take applicable precautions to avoid disturbing materials until directed by Owner.

N. Disposal of Lead Abatement Waste:

1. Test all debris from lead abatement activities to determine whether it is hazardous or non-hazardous waste.

2. Transport and dispose of debris determined to be hazardous waste in accordance with applicable regulations.

3. Package, label, and mark all hazardous waste materials in accordance with applicable requirements of 49 CFR 173, 178 and 179.

4. Maintain hazardous waste manifest from date of transport until date of disposal, destruction or recycling.

5. Return fully executed hazardous waste manifests to Owner within 60 days after date waste accepted by initial transporter.

6. Dispose of material determined to be Construction and Demolition Debris in accordance with 6 NYCRR 360 and 364. Provide trip tickets or other documentation clearly identifying generating site, Owner, transporter, disposal site and amount of material removed from site, transported to and disposed of at disposal site.

7. Refer to Division 02 Section "Lead-Safe Work Practices" for additional requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 35 26

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.

C. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

C. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:

a. Verify selections made under Sample submittals.
b. Demonstrate aesthetic effects.
c. Demonstrate the qualities of products and workmanship.
d. Demonstrate successful installation of interfaces between components and systems.
e. Perform preconstruction testing to determine system performance.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

E. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

F. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.

1.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.

D. Reports: Prepare and submit certified written reports and documents as specified.

E. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 REPORTS AND DOCUMENTS

A. Reports and documents are to be uploaded to Submittal Exchange under the Testing Reports – Contractors tab.

B. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

C. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

D. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is an appropriately licensed design professional legally qualified to practice in New York State and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, correct, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.

2. Build mockups in location indicated or, if not indicated, as directed by Architect or Construction Manager.

3. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.

4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.

5. Demonstrate the proposed range of aesthetic effects and workmanship.

6. Obtain Architect's and Construction Manager's approval of mockups before starting corresponding Work, fabrication, or construction.

7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.

8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

10. Demolish and remove mockups when directed unless otherwise indicated.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.

    a. For testing or inspecting services indicated as Owner’s responsibility, notify Owner and testing agency at least 3 business days in advance of time when Work that requires testing or inspecting will be performed.

4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority , Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Commissioning Authority, , Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.

2. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:

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 Architect, Commissioning Authority, , Construction Manager, and Contractor 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 Commissioning Authority, through 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 reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and Construction Manager's reference during normal working hours.

3.2 CORRECTION AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, correct damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Correction and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

Attachment: A1 Statement of Special Inspections

END OF SECTION 01 40 00

TETRA TECH
ARCHITECTS & ENGINEERS

STATEMENT OF SPECIAL INSPECTIONS

Project: *ADDITIONS & ALTERATIONS TO ELM STREET ELEMENTARY SCHOOL PHASE 2*

Location: *WAVERLY, NEW YORK*

Owner: *WAVERLY CENTRAL SCHOOL DISTRICT*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code of New York State. It includes a schedule of Special Inspection services applicable to this project. *Refer to individual technical specification sections for additional testing requirements*.

This document includes the following parts:

Qualifications of Inspectors and Testing Technicians

Schedule of Special Inspection Services

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Qualifications* on the Schedule.

PE	Structural Engineer – a licensed PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Association of the Wall and Ceilings Industries International (AWCI)

AWCI 12-B	Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide.

Schedule of Special Inspection Services

INSPECTION AND TESTING *("Continuous" & "Periodic" defined by the Code; refer to applicable Technical Specification Section for specific frequency requirements)*	**REQUIRED** (*Required if checked; Not Applicable if not checked*)	**TECHNICAL SPECIFICATION SECTION** (*Refer to for additional information*)	**CONTINUOUS**	**PERIODIC**
Cast-in-Place Concrete (1705.3)				
1. Inspection of reinforcing steel and verify placement	☒	03 30 00	☐	☒
2. Inspection of reinforcing steel welding:				
a. Verification of ASTM A706 material	☐	03 30 00	☐	☒
b. Inspect single-pass fillet welds, maximum 5/16"	☐	03 30 00	☐	☒
c. Inspect all other welds	☐	03 30 00	☒	☐
3. Inspection of anchors to be installed in concrete prior to and during placement	☒	03 30 00	☒	☐
4. Inspect anchors post-installed in hardened concrete				
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	☐	03 30 00	☒	☐
b. Mechanical anchors and adhesive anchors not defined in 4a.	☒	03 30 00	☐	☒
5. Verify use of required design mix	☒	03 30 00	☐	☒
6. Sampling fresh concrete for fabricating specimens for strength testing, perform slump and air content tests, and measure temperature of concrete	☒	03 30 00	☒	☐
7. Inspection of concrete and shotcrete placement for proper application techniques	☒	03 30 00	☒	☐
8. Verify maintenance of specified curing temperature and techniques	☒	03 30 00	☐	☒
9. Verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete, and prior to removal of shores and forms from beams and structural slabs	☐	03 30 00	☐	☒
10. Inspection of formwork for shape, location and dimensions of the concrete member being formed	☒	03 30 00	☐	☒
11. Inspection of post-tensioning operations	☐	03 38 16	☒	☐

Precast Concrete (1705.3)				
1. Inspection of reinforcing steel	☐	03 41 00	☐	☒
2. Verify use of required design mix	☐	03 41 00	☐	☒
3. Inspection of prestressed operations				
a. Application of prestressing forces	☐	03 41 00	☒	☐
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system	☐	03 41 00	☒	☐
4. Sampling fresh concrete; slump, air content, temperature, strength test specimens	☐	03 41 00	☒	☐
5. Inspection of formwork for shape, location and dimensions of the concrete member being formed	☐	03 41 00	☐	☒
6. Inspection of concrete placement for proper application techniques	☐	03 41 00	☒	☐
7. Inspection for maintenance of specified curing temperature and techniques	☐	03 41 00	☐	☒
8. Erection of precast concrete members	☐	03 41 00 03 48 10	☐	☒

Fabricated Items (1704.2.5 and 1705.11)				
1. Inspection of structural, load-bearing or lateral load-resisting members or assemblies as noted on Contract Documents that are fabricated in a fabricator's shop	☐	?? ?? ??	☐	☐
Exceptions: a. The fabricator has been approved to perform work without special inspections per BCNYS 1704.2.5.1. b. The members or assemblies are to be fabricated on site. Then refer to the respective material categories for inspections.				

Masonry (1705.4)				
Level 1	☐	04 20 00		
1. Prior to construction, verify certificates of compliance used in masonry construction	☐	04 20 00	☐	☐
Level 2 or Level 3	☒ Level 2 ☐ Level 3	04 20 00		
1. Prior to construction, verify compliance with the approved submittals.	☒	04 20 00	☐	☐
2. Prior to construction, verify *f'm*, except where specifically exempted by the Code	☒	04 20 00	☐	☐
3. During construction, verify Slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site	☒	04 20 00	☐	☐
4. During construction, verify *f'm* for every 5,000 sqft	☐	04 20 00	☐	☐
5. During construction, verify proportions of materials in premixed or preblended mortar, and grout other than self-consolidating grout, as delivered to the project site.	☒	04 20 00	☐	☐
6. At start of masonry construction, verify to ensure compliance:				
a. Proportions of site prepared mortar.	☒	04 20 00	☐	☒
b. Grade, type and size of reinforcement, connectors, and anchor bolts.	☒	04 20 00	☐	☒
c. Sample panel construction.	☒	04 20 00	☐	☒
7. Prior to grouting, verify that the following are in compliance:				
a. Grout space	☒	04 20 00	☐	☒
b. Placement of reinforcement, connectors, and anchor bolts	☒	04 20 00	☐	☒
c. Proportions of site-prepared grout	☒	04 20 00	☐	☒
8. During construction, verify compliance of the following:				
a. Materials and procedures with the approved submittals.	☒	04 20 00	☐	☒
b. Placement of masonry units and mortar joint construction.	☒	04 20 00	☐	☒
c. Size and location of structural members.	☒	04 20 00	☐	☒
d. Type, size and location of anchors including anchorage of masonry to structural members, frames or other construction	☒	04 20 00	☐	☒
e. Welding of reinforcing bars	☐	04 20 00	☒	☐
f. Preparation, construction and protection of masonry during cold or hot weather	☒	04 20 00	☐	☒
g. Placement of grout.	☒	04 20 00	☒	☐
9. Observe preparation of grout specimens, mortar specimens and/or prisms	☒	04 20 00	☐	☒

Structural Steel (1705.2.1)				
1. Minimum inspections prior to welding per AISC 360 (including but not limited to material verification, welder qualification and fit-up of joints).	☒	05 12 00 05 50 00	☒	☐
2. Minimum inspections during welding per AISC 360	☒	05 12 00	☒	☐
a. Placement and installation of steel headed stud anchors	☐	05 12 00	☒	☐
b. Verification of ASTM A 706 material	☐	05 12 00	☐	☒
c. Testing of resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.	☐	05 12 00	☒	☐
3. Minimum inspections after welding per AISC 360 (including but not limited to size, length and location of welds; welds meet visual acceptance criteria; and repair activities)	☒	05 12 00 05 50 00	☒	☐
4. Inspection of welding via UT for CJP groove welds subject to transversely applied tension loading in butt, T-, and Corner joints				
a. Risk Category III or IV structures	☒	05 12 00	☒	☐
b. Risk Category II structures	☐	05 12 00	☐	☒
5. Minimum inspections prior to high-strength bolting (except for snug-tight joints) per AISC 360 (including but not limited to material verification of high-strength bolts, nuts, and washers; and bolting procedures)	☒	05 12 00	☒	☐
6. Minimum inspections during high-strength bolting (except for snug-tight joints) per AISC 360 (included but not limited to assemblies and positioning)	☒	05 12 00		
a. For pretension/slip-critical connections using turn-of-nut with match marking method, direct-tension-indicator method, or twist-off-type tension control bolt method.	☒	05 12 00	☐	☒
b. For pretension/slip-critical connections using calibrated wrench method or turn-of-nut method without matchmarking	☒	05 12 00	☒	☐
7. Minimum inspections after high-strength bolting per AISC 360	☒	05 12 00	☐	☒
8. Inspection of fabricated and/or erected steel to verify compliance with the construction drawings.	☒	05 12 00 05 50 00	☐	☒
a. Details such as bracing and stiffeners	☒	05 12 00	☐	☒
b. Member locations	☒	05 12 00	☐	☒
c. Joint details	☒	05 12 00	☐	☒
9. Inspection during placement of anchor rods and other embedded items supporting structural steel for compliance with construction drawings.	☒	05 12 00	☒	☐
10. Material verification of structural steel: Identification markings to conform to ASTM standards specified in the approved construction documents	☒	05 12 00	☐	☐

Open-Web Steel Joists and Joist Girders (1705.2.4)				
1. Installation of open-web steel joists and joist girders				
a. End connections – welded or bolted per SJI	☐	05 21 00	☐	☒
b. Bridging – horizontal or diagonal				
1. Standard bridging per SJI	☐	05 21 00	☐	☒
2. Bridging that differs from SJI specification	☐	05 21 00	☐	☒
2. Minimum inspections during welding	☐	05 21 00	☒	☐
a. Placement and installation of steel headed stud anchors	☐	05 21 00	☒	☐
b. Testing of welds – bend tests on a minimum of 1 out of every 100 shear studs	☐	05 21 00	☐	☒

Cold-Formed Steel Deck (1705.2.3)				
1. Inspection or Execution Tasks Prior to Deck Placement per SDI QA/QC (including but not limited to compliance of materials with construction documents)	☒	05 31 00	☐	☒
2. Inspection or Execution Tasks After to Deck Placement per SDI QA/QC (including but not limited to compliance of installation with construction documents)	☒	05 31 00	☐	☒
3. Inspection or Execution Tasks Prior to Welding per SDI QA/QC (including but not limited to verification of procedures and certifications)	☒	05 31 00	☐	☒
4. Inspection or Execution Tasks During Welding per SDI QA/QC	☒	05 31 00	☒	☐
5. Inspection or Execution Tasks After Welding per SDI QA/QC (including but not limited to size, length and location of welds; welds meet visual acceptance criteria; and repair activities)	☒	05 31 00	☐	☒
6. Inspection or Execution Tasks Prior to Mechanical Fastening per SDI QA/QC (including but not limited to material verification)	☒	05 31 00	☐	☒
7. Inspection or Execution Tasks During Mechanical Fastening per SDI QA/QC (including but not limited to verification of positioning and installation)	☒	05 31 00	☒	☐
8. Inspection or Execution Tasks After Mechanical Fastening per SDI QA/QC (including but not limited to verification of spacing, type and location; repair activities)	☒	05 31 00	☐	☒

Cold-Formed Steel Trusses (1705.2.5)				
1. For trusses spanning 60 feet or greater:				
a. Verify the temporary installation restraint/bracing is installed per the approved truss submittal package.	☐	05 40 00	☐	☒
b. Verify the permanent individual truss member restraint/bracing is installed per the approved truss submittal package.	☐	05 40 00	☐	☒

Wood Construction (1705.5)				
1. For Metal-plate connected wood trusses spanning 60 feet or greater:				
a. Verify the temporary installation restraint/bracing is installed per the approved truss submittal package.	☐	06 17 53	☐	☒
b. Verify the permanent individual truss member restraint/bracing is installed per the approved truss submittal package.	☐	06 17 53	☐	☒
2. Inspect High-load diaphragms for grade and thickness of sheathing material; nominal size of framing members; fastener diameter and length; fastener layout and spacing	☐	06 10 00 06 16 00	☐	☒

Exterior Insulation and Finish Systems (EIFS) (1705.17)				
1. Inspection of water-resistive barrier coating when installed over a sheathing substrate.	☐	07 24 19 07 24 23	☐	☐

Sprayed Fire-resistant Materials (1705.15)				
1. Verify surface preparation in accordance with manufacturer's written instructions.	☐	07 81 00	☐	☐
2. Verify temperature and area ventilation before and after application in accordance with manufacturer's written instructions.	☐	07 81 00	☐	☐
3. Verify thickness of sprayed fire-resistant materials				
a. Minimum of 4 measurements per 1,000 sq ft of floor, roof and wall assembly areas, or part thereof at each story.	☐	07 81 00	☐	☐
b. Minimum of 25% of structural members at each story.	☐	07 81 00	☐	☐
4. Verify density of sprayed fire-resistant materials.				
a. Minimum of one sample per 2,500 sq ft of floor, roof and wall assembly areas, or part thereof at each story.	☐	07 81 00	☐	☐
b. Minimum of one sample from each type of structural framing member per 2,500 sq ft of floor area or part thereof at each story.				
5. Verify cohesive/adhesive bond strength of sprayed fire-resistant materials.				
a. Minimum of one sample per 2,500 sq ft of floor, roof and wall assembly areas or part thereof at each story.	☐	07 81 00	☐	☐
b. Minimum of one sample from each type of structural framing member per 2,500 sq ft of floor area or part thereof at each story	☐	07 81 00	☐	☐
c. Bond tests to qualify a primer, paint, or encapsulant when acceptable bond strength performance between those coatings and the fire-resistant material has not been determined.	☐	07 81 00	☐	☐

Mastic and Intumescent Fire-resistant Coatings (1705.16)				
1. Verify surface preparation, application, and thickness when applied to structural elements and decks in accordance with AWCI 12-B	☐	07 81 23	☐	☐

Fire-Resistant Penetrations and Joints (1705.18)				
1. Inspection of through-penetrations and membrane penetration firestops in buildings in Risk Category III or IV per ASTM E2174	☐	07 84 13	☐	☐
2. Inspections of fire-resistant joint systems and perimeter fire barrier systems in buildings in Risk Category III or IV per ASTM E2393	☐	07 84 43 07 95 13.13	☐	☐

Soils (1705.6)				
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity	☒	31 20 00	☒	☐
2. Verify excavations are extended to proper depth and have reached proper material	☒	31 20 00	☒	☐
3. Perform classification and testing of compacted fill materials	☒	31 20 00	☐	☒
4. Verify use of proper materials and procedures in accordance with approved geotechnical report, verify densities and lift thicknesses during placement and compaction of compacted fill	☒	31 20 00	☒	☐
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly	☒	31 20 00	☒	☐

Driven Deep Foundations (1705.7)				
1. Verify element materials, sizes and lengths comply with the requirements	☐	31 62 13 31 62 16 31 62 19 31 62 23	☒	☐
2. Determine capacities of test elements and conduct additional load tests, as required	☐	31 62 13 31 62 16 31 62 19 31 62 23	☒	☐
3. Inspect driving operations and maintain complete and accurate records for each element	☐	31 62 13 31 62 16 31 62 19 31 62 23	☒	☐
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element	☐	31 62 13 31 62 16 31 62 19 31 62 23	☒	☐
5. For steel elements, perform additional special inspections in accordance with 1705.2	☐	31 62 16 31 62 23	☐	☐
6. For concrete elements and concrete-filled elements, perform additional special inspections in accordance with Section 1705.3	☐	31 62 13 31 62 23	☐	☐
7. For specialty elements, perform additional inspections	☐	31 62 13 31 62 16 31 62 19 31 62 23	☐	☐

Cast-In-Place Deep Foundations (1705.8)				
1. Inspect drilling operations and maintain complete and accurate records for each element	☐	31 63 16 31 63 29	☒	☐
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable), and adequate end bearing strata capacity. Record concrete or grout volumes.	☐	31 63 16 31 63 29	☒	☐
3. For concrete elements, perform tests and additional special inspections in accordance with Section 1705.3	☐	31 63 16 31 63 29	☐	☐

Helical Pile Foundations (1705.9)				
1. Inspect installation operations and maintain complete and accurate records for each pier	☐	31 66 15	☒	☐
2. Verify and record installation equipment used, pile dimensions, tip elevations, final depth, final installation torque other data as required	☐	31 66 15	☒	☐

Wind Resistance Inspections (1705.12)				
1. Structural wood – of elements in main windforce-resisting system				
a. Inspection of field gluing operations.	☐	06 10 00 06 16 00 06 17 53	☒	☐
b. Inspection of nailing, bolting, anchoring and other fastening	☐	06 10 00 06 16 00 06 17 53	☐	☒
2. Cold-formed steel light-frame construction – of elements in main windforce-resisting systems.				
a. Inspection of welding operations	☐	05 40 00	☐	☒
b. Inspection of screw attachment, bolting, anchoring and other fastening	☐	05 40 00	☐	☒
3. Wind-resisting components:				
a. Inspection of roof covering, roof deck and roof framing connections	☐	05 12 00 05 21 00 05 31 00 07 53 23	☐	☒
b. Inspection of exterior wall covering and wall connections to roof and floor diaphragms and framing	☐	04 20 00 07 24 19 08 41 13 08 44 13	☐	☒

Seismic Resistance Inspections (1705.13)				
1. Structural steel in seismic force-resisting systems:				
a. Seismic force-resisting systems – inspection in accordance with AISC 341	☐	05 12 00	☒	☐
b. Structural steel elements - inspection in accordance with AISC 341	☐	05 12 00	☒	☐
2. Structural wood in seismic-force-resisting systems:				
a. Inspection of field gluing operations.	☐	06 10 00 06 17 00 06 17 53	☒	☐
b. Inspection of nailing, bolting, anchoring and other fastening	☐	06 10 00 06 17 00 06 17 53	☐	☒
3. Cold-formed steel framing in seismic-force-resisting systems				
a. Inspection of welding operations	☐	05 40 00	☐	☒
b. Inspection of screw attachment, bolting, anchoring and other fastening	☐	05 40 00	☐	☒
4. Designated seismic systems – Inspection systems requiring Seismic Qualification per ASCE 7. Verify label, anchorage and mounting conforms to certificate of compliance	☐	?? ?? ??	☐	☒
5. Architectural components				
a. Inspection of erection and fastening of exterior cladding	☐	?? ?? ??	☐	☒
b. Inspection of erection and fastening of interior and exterior nonbearing walls	☐	?? ?? ??	☐	☒
c. Inspection of erection and fastening of interior and exterior veneer	☐	?? ?? ??	☐	☒
d. Access floors – inspection of anchorage	☐	?? ?? ??	☐	☒
6. Mechanical, plumbing and electrical components:				
a. Inspection of anchorage of electrical equipment for emergency and standby power systems	☐	?? ?? ??	☐	☒
b. Inspection of anchorage installation of other electrical equipment	☐	?? ?? ??	☐	☒
c. Inspection of installation and anchorage of piping systems and associated mechanical units designed to carry hazardous materials	☐	?? ?? ??	☐	☒
d. Inspection of installation and anchorage of ductwork designed to carry hazardous materials	☐	?? ?? ??	☐	☒
e. Inspection of installation and anchorage of vibration isolation systems	☐	?? ?? ??	☐	☒
f. Inspection of installation of mechanical and electrical equipment where automatic fire sprinkler systems are installed to verify clearances	☐	?? ?? ??	☐	☒
7. Seismic isolation system: Inspection during fabrication and installation of isolator units and energy dissipation devices that are part of the seismic isolation system	☐	?? ?? ??	☐	☒

8. Cold-formed steel special bolted moment frames: Inspection during installation of frames part of the seismic isolation system	☐	?? ?? ??	☐	☒

Seismic Resistance Structural Testing				
1. Structural steel in seismic force-resisting systems:				
a. Seismic force-resisting systems: Non-destructive testing in accordance with quality assurance requirements of AISC 341	☐	05 12 00	☐	☐
b. Structural steel elements: nondestructive testing in accordance with the quality assurance requirements of AISC 341	☐	05 12 00	☐	☐
2. Nonstructural Components: Confirm certification of compliance of seismic qualification for supports and attachments has been submitted by manufacturer for specified systems	☐	?? ?? ??	☐	☐
3. Designated seismic systems: Confirm certification of compliance of seismic qualification has been submitted for designated seismic systems	☐	?? ?? ??	☐	☐
4. Seismic isolation systems: Testing per ASCE 7, Section 17.8	☐	?? ?? ??	☐	☐

Structural Observations				
1. Structural observations for structures	☒	05 12 00		
2. Structural observations for seismic resistance	☐	?? ?? ??		
3. Structural observations for wind resistance	☐	?? ?? ??		

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

B. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

C. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

D. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

E. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project Site.

F. "Provide": Furnish and install, complete and ready for the intended use.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. When the building code in effect for the Project cites a different edition, comply with the building code-cited edition.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AA - Aluminum Association (The); www.aluminum.org.
2. AABC - Associated Air Balance Council; www.aabc.com.
3. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
4. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
5. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
6. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
7. ABBA - Air Barrier Association of America; www.airbarrier.org.
8. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
9. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
10. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
11. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
12. AF&PA - American Forest & Paper Association; www.afandpa.org.
13. AGA - American Gas Association; www.aga.org.
14. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
15. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
16. AI - Asphalt Institute; www.asphaltinstitute.org.
17. AIA - American Institute of Architects (The); www.aia.org.
18. AISC - American Institute of Steel Construction; www.aisc.org.
19. AISI - American Iron and Steel Institute; www.steel.org.
20. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
21. ALSC - American Lumber Standard Committee, Incorporated; www.alsc.org.
22. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
23. ANSI - American National Standards Institute; www.ansi.org.
24. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
25. APA - APA - The Engineered Wood Association; www.apawood.org.
26. APA - Architectural Precast Association; www.archprecast.org.
27. API - American Petroleum Institute; www.api.org.
28. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
29. ARI - American Refrigeration Institute; (See AHRI).
30. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
31. ASCE - American Society of Civil Engineers; www.asce.org.
32. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).

33. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
34. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
35. ASNT - American Society for Nondestructive Testing (The); www.asnt.org
36. ASSE - American Society of Safety Engineers (The); www.asse.org.
37. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
38. ASTM - ASTM International; www.astm.org.
39. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
40. AWCI - Association of the Wall and Ceiling Industry; www.awci.org.
41. AWEA - American Wind Energy Association; www.awea.org.
42. AWI - Architectural Woodwork Institute; www.awinet.org.
43. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
44. AWPA - American Wood Protection Association; www.awpa.com.
45. AWS - American Welding Society; www.aws.org.
46. AWWA - American Water Works Association; www.awwa.org.
47. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
48. BIA - Brick Industry Association (The); www.gobrick.com.
49. BICSI - BICSI, Inc.; www.bicsi.org.
50. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
51. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
52. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
53. CDA - Copper Development Association; www.copper.org.
54. CE – Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/.
55. CEA - Canadian Electricity Association; www.electricity.ca.
56. CEA - Consumer Electronics Association; www.ce.org.
57. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
58. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
59. CGA - Compressed Gas Association; www.cganet.com.
60. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
61. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
62. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
63. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
64. CPA - Composite Panel Association; www.pbmdf.com.
65. CPPA – (Formerly: Corrugated Polyethylene Pipe Association; a Division of the Plastic Pipe Institute); www.plasticpipe.org/drainage/.
66. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
67. CRRC - Cool Roof Rating Council; www.coolroofs.org.
68. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
69. CSA - Canadian Standards Association; www.csa.ca.
70. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
71. CSI - Construction Specifications Institute (The); www.csinet.org.
72. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
73. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
74. CWC - Composite Wood Council; (See CPA).
75. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
76. DHI - Door and Hardware Institute; www.dhi.org.

77. ECA - Electronic Components Association;(See ECIA).
78. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
79. ECIA – Electronic Components Industry Association; www.eciaonline.org.
80. EIA - Electronic Industries Alliance; (See TIA).
81. EIMA - EIFS Industry Members Association; www.eima.com.
82. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
83. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
84. ESTA - Entertainment Services and Technology Association; (See PLASA).
85. ETL - Intertek (See Intertek); www.intertek.com.
86. EVO - Efficiency Valuation Organization; www.evo-world.org.
87. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
88. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
89. FM Approvals - FM Approvals LLC; www.fmglobal.com.
90. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
91. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
92. FSA - Fluid Sealing Association; www.fluidsealing.com.
93. FSC - Forest Stewardship Council U.S.; www.fscus.org.
94. FSEC - Florida Solar Energy Center; www.fsec.ucf.edu.
95. GA - Gypsum Association; www.gypsum.org.
96. GANA - Glass Association of North America; www.glasswebsite.com.
97. GS - Green Seal; www.greenseal.org.
98. HI - Hydraulic Institute; www.pumps.org.
99. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
100. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
101. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
102. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
103. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
104. IAS – International Accreditation Service; www.iasonline.org.
105. IAS - International Approval Services; (See CSA).
106. ICBO - International Conference of Building Officials; (See ICC).
107. ICC - International Code Council; www.iccsafe.org.
108. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
109. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
110. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
111. IEC - International Electrotechnical Commission; www.iec.ch.
112. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
113. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
114. IESNA - Illuminating Engineering Society of North America; (See IES).
115. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
116. IGCC - Insulating Glass Certification Council; www.igcc.org.
117. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
118. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
119. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
120. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.

121. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
122. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
123. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
124. ISO - International Organization for Standardization; www.iso.org.
125. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
126. ITU - International Telecommunication Union; www.itu.int/home.
127. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
128. LMA - Laminating Materials Association; (See CPA).
129. LPI - Lightning Protection Institute; www.lightning.org.
130. MBMA - Metal Building Manufacturers Association; www.mbma.com.
131. MCA - Metal Construction Association; www.metalconstruction.org.
132. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
133. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
134. MHIA - Material Handling Industry of America; www.mhia.org.
135. MIA - Marble Institute of America; www.marble-institute.com.
136. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
137. MPI - Master Painters Institute; www.paintinfo.com.
138. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
139. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
140. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
141. NADCA - National Air Duct Cleaners Association; www.nadca.com.
142. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
143. NALP – National Association of Landscape Professionals (Formerly Professional Landcare Network); www.landscapeprofessionals.org.
144. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
145. NBI – New Buildings Institute; www.newbuildings.org.
146. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
147. NCMA - National Concrete Masonry Association; www.ncma.org.
148. NEBB - National Environmental Balancing Bureau; www.nebb.org.
149. NECA - National Electrical Contractors Association; www.necanet.org.
150. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
151. NEMA - National Electrical Manufacturers Association; www.nema.org.
152. NETA - InterNational Electrical Testing Association; www.netaworld.org.
153. NFHS - National Federation of State High School Associations; www.nfhs.org.
154. NFPA - National Fire Protection Association; www.nfpa.org.
155. NFPA - NFPA International; (See NFPA).
156. NFRC - National Fenestration Rating Council; www.nfrc.org.
157. NHLA - National Hardwood Lumber Association; www.nhla.com.
158. NICET - National Institute for Certification in Engineering Technologies; www.nicet.org.
159. NLGA - National Lumber Grades Authority; www.nlga.org.
160. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
161. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
162. NRCA - National Roofing Contractors Association; www.nrca.net.
163. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
164. NSF - NSF International; www.nsf.org.

165. NSPE - National Society of Professional Engineers; www.nspe.org.
166. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
167. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
168. NWFA - National Wood Flooring Association; www.nwfa.org.
169. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
170. PDI - Plumbing & Drainage Institute; www.pdionline.org.
171. PLANET - Professional Landcare Network; (See NALP).
172. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
173. PTI - Post-Tensioning Institute; www.post-tensioning.org.
174. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
175. RFCI - Resilient Floor Covering Institute; www.rfci.com.
176. RIS - Redwood Inspection Service; www.redwoodinspection.com.
177. SAE - SAE International; www.sae.org.
178. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
179. SDI - Steel Deck Institute; www.sdi.org.
180. SDI - Steel Door Institute; www.steeldoor.org.
181. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
182. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
183. SGCC - Safety Glazing Certification Council; www.sgcc.org.
184. SIA - Security Industry Association; www.siaonline.org.
185. SJI - Steel Joist Institute; www.steeljoist.org.
186. SMA - Screen Manufacturers Association; www.smainfo.org.
187. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
188. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
189. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
190. SPIB - Southern Pine Inspection Bureau; www.spib.org.
191. SPRI - Single Ply Roofing Industry; www.spri.org.
192. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
193. SSINA - Specialty Steel Industry of North America; www.ssina.com.
194. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
195. STI - Steel Tank Institute; www.steeltank.com.
196. SWI - Steel Window Institute; www.steelwindows.com.
197. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
198. TABB - Testing, Adjusting and Balancing Bureau; www.tabbcertified.org.
199. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
200. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
201. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
202. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
203. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
204. TMS - The Masonry Society; www.masonrysociety.org.
205. TPI - Truss Plate Institute; www.tpinst.org.
206. TPI - Turfgrass Producers International; www.turfgrasssod.org.
207. TRI - Tile Roofing Institute; www.tileroofing.org.
208. UFAC - Upholstered Furniture Action Council; www.ufac.org.
209. UL - Underwriters Laboratories Inc.; www.ul.com.

210. ULC - Underwriters Laboratories of Canada; www.ulc.ca.
211. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
212. USAV - USA Volleyball; www.usavolleyball.org.
213. USBA - United States Badminton Association; www.usabadminton.org.
214. USGBC - U.S. Green Building Council; www.usgbc.org.
215. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
216. WA – Wallcoverings Association; www.wallcoverings.org.
217. WASTEC - Waste Equipment Technology Association; www.wastec.org.
218. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
219. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
220. WDMA - Window & Door Manufacturers Association; www.wdma.com.
221. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
222. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
223. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
224. WWPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FCC - Federal Communications Commission; www.fcc.gov.
9. FG - Federal Government Publications; www.gpo.gov.
10. GSA - General Services Administration; www.gsa.gov.
11. HUD - Department of Housing and Urban Development; www.hud.gov.
12. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
13. NIST - National Institute of Standards and Technology; www.nist.gov.
14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
15. SD - Department of State; www.state.gov.
16. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.

17. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
18. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
19. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
20. USP - U.S. Pharmacopeia; www.usp.org.
21. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. ADAAG - Accessibility Guidelines for Buildings and Facilities, Available from United States Access Board; www.access-board.gov.

2. AHERA - Asbestos Hazard Emergency Response Act, Available from US Environmental Protection Agency; www.epa.gov.

3. BCNYS - Building Code of New York State, Available from New York State Department of State; www.dos.ny.gov/DCEA/.

4. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.

5. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://quicksearch.dla.mil.

6. DSCC - Defense Supply Center Columbus; (See FS).

7. FED-STD - Federal Standard; (See FS).

8. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

9. IBC - International Building Code, Available from International Code Council; www.iccsafe.org.

10. LEED - Leadership in Energy and Environmental Design (Green Building Rating Systems), Available from U.S. Green Building Council; www.usgbc.org.

11. MILSPEC - Military Specification and Standards; (See DOD).

12. NEC - National Electrical Code, Available from NFPA (National Fire Protection Association); www.nfpa.org.

13. NSPC - National Standard Plumbing Code, Available from Plumbing-Heating-Cooling Contractors Association; www.phccweb.org.

14. NYSED/MPS - New York State Education Department Manual of Planning Standards, Available from New York State Education Department (Facilities Planning); www.p12.nysed.gov/facplan/forms.html.

15. USAB - United States Access Board; www.access-board.gov.

16. UFAS - Uniform Federal Accessibility Standards Available from Access Board; www.access-board.gov.

17. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. NYSDEC - New York State Department of Environmental Conservation; www.dec.ny.gov.
3. NYSDOH - New York State Department of Health; www.health.ny.gov.
4. NYSDOT - New York State Department of Transportation; www.dot.ny.gov.
5. NYSED - New York State Education Department (Facilities Planning); www.p12.nysed.gov/facplan/.
6. NYSERDA - New York State Energy Research and Development Authority; www.nyserda.ny.gov.
7. OSHPD - Office of Statewide Health Planning and Development (State of California); www.oshpd.ca.gov.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Division 01 Section "Multiple Contract Project Summary - Project Schedule" for responsibilities for temporary facilities and controls for projects utilizing multiple contracts.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

1.4 SUBMITTALS, GENERAL

A. General: Submit all informational submittals required by this Section concurrently.

1.5 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Shoring and Bracing Plan: Submit shoring and bracing plan, designed, signed and sealed by the qualified professional engineer responsible for its preparation.

C. Project Identification Signs: Show fabrication and installation details, including layouts, typestyles, graphic elements, and message content.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temp fencing to be provided and maintained by the GC. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.

B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

C. Plastic Barrier Fencing: High-density polyethylene mesh, high-visibility orange; minimum 4 feet high with minimum 6-foot-long wood stakes spaced a maximum of 8 feet on center, and with a continuous wood top stake; steel wire or nylon cable ties every 12 inches on center; with warning signs as indicated or required.

D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats minimum 36 by 60 inches.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: The owner will be providing construction office for meetings/gatherings and coordination purposes at the High School. Offices are located at the west end of the high school campus in the yellow modular home. CM field office will be located in this space.

Waverly CSD High School is located at:

1 Frederick Street - Waverly, NY14892

B. If the Prime General Contractor would like to have an on site dedicated office space, it is recommended that a ground storage/office combo be used due to the lack of staging space. There will not be enough staging space for all Primes to do this.

C. Ground storage units: Provide storage sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control. Use of permanent HVAC system is not permitted.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. HVAC Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

a. Directly vent all combustion gases to the exterior.

b. Design system to use 100 percent outside make-up air.

c. 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) Temp-Air, Inc.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service. Use charges are to be by the owner.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to City of Waverly as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

1. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

2. Provide reduced pressure zone (RPZ) backflow preventer at connection to existing system. Provide appropriate drainage piping with air gap from the backflow preventer relief port to an approved discharge point.

    a. Basis-of-Design Product: Watts Water Technologies; Series LF909.

3. Provide 3/4-inch hose connections if truly needed spaced so that a 200-foot-long hose will reach all areas of building where a Contractor requires water.

4. Provide sign at each outlet indicating temporary water sources are not for human consumption

D. Sanitary Facilities provided by the Plumber: Provide temporary toilets, wash facilities, and bottled drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Use of Owner’s toilet facilities and drinking water facilities is not permitted.

1. Provide continual supply of toilet paper, paper towels, soap, and bottled drinking water.

E. Temporary Heating and Cooling provided by the mechanical contract: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.

    a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.

    b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.

3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Temporary power by the Electrical prime.

1. Install electric power service overhead unless otherwise indicated.

2. Connect temporary service to Owner's existing power source, as directed by Owner. Maintain equipment in a condition acceptable to Owner.

3. Service Requirements:

a. Provide 120/208 V, 60 Hz, single/three phase alternating current with capacity to accommodate maximum electric power and lighting requirements during construction.

b. Provide minimum of two each 120/208 V duplex outlets spaced so that a 50-foot-long extension cord will reach all areas of building where a Contractor requires electric power.

4. Distribution System: Provide poles, pole hardware, overhead, exterior and interior wiring, transformers, and similar items required for electric power service and lighting.

a. Single-Phase Wiring: 3-wire, 120/208 V feeders, with No. 12 three- or four-wire branch circuits conforming to NEC No. 210-7 and OSHA requirements, with branch circuit protective device.

1) Provide each branch circuit with 120/208 V, single-phase fused grounding-type power outlets, buss type SRX or SKY, with approved covered box and fuses as required.

2) Provide panelboards containing ground fault interrupter type circuit breakers meeting applicable NEC requirements with required number of poles.

a) Basis-of-Design Product: Square D by Schneider Electric; QO120GFI for each branch circuit allowing maximum total load of 16 amps on each 20 amp branch circuit.

3) Provide appropriately-sized green grounding wiring complying with NEC requirements in feeder and branch circuits to provide grounding of all 120 and 208 V outlets in approved manner.

b. Three-Phase Wiring: Three-wire, 208 V feeders, with fused disconnect switches, allowing minimum 5 hp motor load at 208 V from each feeder, and providing four three-phase outlets on each floor near points of use.

5. Extension Cords: Temporary 3-wire plug-in extensions with grounding features at both ends.

H. Temp Lighting by the Electrical Contractor: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until Substantial Completion.

B. Temporary Roads and Paved Areas by the GC: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on the Drawings.

1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations. Any damage to paving to be by the prime who created the damage.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.

2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."

3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Use the owners designated parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. GC to Remove snow and ice as required to minimize accumulations in all areas of construction operations.

G. Project Signs: Provide Project signs as indicated, conforming to format as indicated on the contract documents. Unauthorized signs are not permitted.

H. Waste Disposal Facilities: Dumpsters are to be provided by the GC. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."

1. Waste from Construction Operations: Includes materials not intended or necessary for completion of Work, including packing materials, food waste, waste paper, and similar items. Excavated material is not included in this definition.

2. Chutes: Provide enclosed chutes for removal of waste from construction operations from levels above grade level or roof. Remove waste in a controlled manner; materials shall not be dropped or thrown from heights.

I. Recycling Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Packaging:

    a. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
    b. Polystyrene Packaging: Separate and bag materials.
    c. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site.

3. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

J. Shoring and Bracing: Provide and maintain shoring, bracing, and structural supports, designed by a qualified professional engineer, required to preserve stability and prevent movement, settlement, or collapse of new and existing construction and to prevent unexpected or uncontrolled movement or collapse of construction.

K. Staging and Scaffolding: Provide facilities necessary for supporting materials and personnel in accordance with requirements of authorities having jurisdiction

L. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

M. Temporary Elevator Use: Use of elevators is not permitted.

N. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

O. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

P. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control by the GC:

1. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to “New York State Standards and Specifications for Erosion and Sediment Control” published by Empire State Chapter Soil and Water Conservation Society, under the direction of the New York State Department of Environmental Conservation, Division of Water.

a. Soil Erosion and Sediment Control (SESC) Plan: Comply with SESC Plan for this Project in consultation with appropriate local agencies and soil conservation service.

1) At the Preconstruction Conference, Architect will provide the Contractor, for its signing, certificates of compliance, which the Architect will submit with the SESC plan to the New York State Department of Environmental Conservation (NYSDEC) to satisfy the State Pollutant Discharge Elimination System (SPDES) permit. The Contractor is responsible for complying with the SPDES permit and Stormwater Pollution Prevention Plan (SPPP) throughout construction.

2) At the Preconstruction Conference, submit schedule for completion of installation of measures identified in SESC Plan.

a) Do not begin construction at the site until measures identified in the SESC Plan have been accepted by the Architect and installed at site.

3) If conditions change during construction, submit proposed revisions to the SESC Plan to the Architect and other agencies identified in the SPDES permit and SPPP.

2. General Soil Erosion and Sediment Control Measures:

a. Refer to SESC Plan for specific measures in addition to those identified below.

b. Take precautions to prevent mud from construction site accumulating on adjoining public roads and sidewalks and Owner's roads and sidewalks. Clean accumulations of mud from public roads and sidewalks and from Owner's roads and sidewalks when required by public authorities and when directed by Architect.

c. Plan and execute construction by methods to control surface drainage from cuts and fills and from borrow areas, and to prevent erosion and sedimentation.

1) Minimize amount of bare soil exposed at one time.

2) Provide temporary measures and erosion control devices or methods appropriate to conditions at site.

3) Construct fills and waste areas by selective placement to avoid erosive surface silts or clays.

4) Inspect earthwork to detect evidence of erosion and sedimentation as outlined in the SPDES permit and SPPP. Immediately apply corrective measures at no cost to the Owner. Contractor will be responsible for any fines issued by any agency as a result of non-compliance with the SPDES permit and SPPP.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

1. Maintain protection zones free of weeds and trash.

2. Do not prune roots or branches of trees to remain without approval of Architect.

a. If pruning is approved, engage an experienced, qualified arborist to perform pruning and treating.

3. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction as environmentally safe.

G. Site Enclosure Fence at lay down / staging area to be by the GC: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Keys to be shared with the District.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

1. Where temporary egress doors occur, provide minimum clear opening width of 36” minimum.

2. Retain "Covered Walkway" Paragraph below if covered walkways are required and area is insufficient to conduct operations, including delivery of materials. Include installation details on Drawings.

K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.

1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

2. Paint and maintain appearance of walkway for duration of the Work.

L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior. Face exterior enclosures with plywood, unless otherwise approved, in advance, by Architect. Polyethylene sheet may not be used for exterior enclosures.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

M. Temporary Partitions by the GC: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
3. Insulate partitions to control noise transmission to occupied areas.
4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
5. Paint surfaces exposed to view in areas occupied by Owner.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

N. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

A. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

B. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

C. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, HVAC, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

a. Heating: Provide heating between September 1 through May 31.

1) Maintain minimum interior temperature of 70 deg F.
2) Maintain relative humidity levels between 50 and 55 percent.

2. Where temperature and humidity levels required for the proper installation and application of a product or system differ from those listed above, provide supplemental temporary services to maintain the required temperature and humidity levels.

3. Use temporary duct systems, industrial fans, or other equipment to circulate tempered air to all areas of work.

4. Maintain operation of temporary lighting in corridors, stairwells and similar locations on a 24-hour basis.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.

2. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," 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.

1.4 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request.

   a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. The use of asbestos containing building materials is prohibited.

1. Contractor is responsible for providing closeout documentation certifying no asbestos containing building materials have been used in the Work.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for review and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Warranty periods related to Boilers and Accessory Equipment, and Air Conditioning Equipment do not begin until one year after the date of substantial completion.
3. See individual Specification Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Products:

a. Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

2. Manufacturers:

a. Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers, or a product by an unnamed manufacturer that complies with requirements. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Examination of conditions.
2. Preparation for construction.
3. Construction layout.
4. Field engineering and surveying.
5. Installation of the Work.
6. Cutting and patching.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.
10. Correction of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.
B. Structural Layout Plan: Survey of Structural Grid in relation to existing building(s).

1.5 CLOSEOUT SUBMITTALS

A. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
B. Certified Surveys: Submit two copies signed by professional engineer.

1.6 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or 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.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.

B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

1. Structural Layout Plan: Perform Survey of Structural Grid as provided in Contract Documents, including any specific Layout Notes and/or Plan. Provide Structural Layout Plan for review by Engineer prior to performing any additional work.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. 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.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place 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.

E. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

H. 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 practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

2. 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 in-place 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, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

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.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

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

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

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."
B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Architect may issue "Construction Deficiency Report" for items identified by Architect as needing correction. Promptly repair or remove and replace defective construction identified in Construction Deficiency Report. Provide written notification to Architect when identified item has been corrected.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. Documents Prior to Substantial Completion: Complete the following before Contract-scheduled date of Substantial Completion:

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, electrical inspection reports, preliminary balance reports, and similar releases. Documents are to be uploaded to Submittal Exchange under the Closeout tab.

2. Submit notarized letter on Contractor's letterhead certifying no asbestos containing building materials have been used in the Work. Also include a copy in the Operation and Maintenance Manuals. Documents are to be uploaded to Submittal Exchange under the Closeout tab.

3. Submit notarized letter on Contractor's letterhead certifying all required inspections/tests required within the technical specification sections have been successfully completed. Attach to the letter copies of all quality control testing reports, other field test reports, manufacturer required quality control and certifications, and all other quality control reports, certifications, or statements as required by each individual technical specification section. Such attached documentation is to be organized and labeled by each individual technical specification. Documents are to be uploaded to Submittal Exchange under the Test Reports – Contractors tab. Also include a copy in the Operation and Maintenance Manuals.

4. Submit testing, adjusting, and balancing records. Also include a copy in the Operation and Maintenance Manuals. Documents are to be uploaded to Submittal Exchange under the Submittal tab.

5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance. Documents are to be uploaded to Submittal Exchange under the Closeout tab.

B. Procedures Prior to Substantial Completion: Complete the following before Contract-scheduled date of Substantial Completion:

1. Advise Owner of pending insurance changeover requirements.

2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

3. Complete startup and testing of systems and equipment.

4. Perform preventive maintenance on equipment used prior to Substantial Completion. Maintenance to be performed by a factory authorized service representative so as not to void the equipment warranty.

5. Advise Owner of changeover in heat and other utilities.

6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

7. Complete all items on any Field Observation and Construction Deficiency Reports and submit a copy of the reports to the Architect and Construction Manager identifying how each item was addressed in detail, including the date of completion.

8. Complete final cleaning requirements as specified below, including touchup painting.

9. Repair and restore marred exposed finishes to eliminate visual defects.

10. Complete all items noted as requiring completion/correction from the Commissioning consultant and TAB (Testing and Balancing) consultant.

11. Successfully complete all inspections/tests required as part of the individual technical specification sections. Copies of all such inspections/tests are to be included in the Operation and Maintenance manual, refer to Specifications Section 01 78 23.

C. Inspection: No later than 14 days prior to the Contract-scheduled date of Substantial Completion, submit a letter to the Architect and Construction Manager confirming the work is on schedule for Substantial Completion by the contract specified date. No later than seven 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.

1. Additional Inspections: Request additional Substantial Completion inspections when the work that was not complete for the scheduled Substantial Completion inspection is now ready to inspect.

    a. Costs for such additional Substantial Completion inspections will be deducted from sums otherwise due the Contractor by deduct Change Order.

2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FUNCTIONAL COMPLETION PROCEDURES

A. Functional Completion applies to Contract Work being Commissioned. The commissioning of Divisions 01, 22, 23, and 26 (as applicable to each Contractor) must be complete prior to Functional Completion, except for the following:

1. Deferred Work approved in writing by the Architect.
2. Control system training planned to be performed after occupancy and final acceptance.
3. Any required seasonal TAB work to be formed during Warranty period.
4. Other approved deferred testing.

B. Completion of Commissioning required to demonstrate Functional Completion includes the following as applicable for all systems, but is not limited to:

1. Completed and signed pre-functional checklists and start-up documentation.
2. Requested trend logs complete, data and forms submitted and approved.
3. Completion of all functional testing.
4. Required training of Owner personnel completed and approved.
5. Submission of final approved TAB report.
6. Submission of final approved commissioning report.
7. Submission of the approved O&M manuals.
8. All identified deficiencies have been corrected or are approved in writing by the Owner to be excepted from this milestone.

C. The Architect will determine the date of Functional Completion after reviewing the Commissioning Agent’s recommendation for Functional Completion.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before final inspection for determining final completion, complete the following:

1. Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance, what corrective action was taken, and the date of completion. Items that are in dispute shall have an explanation attached. Documents are to be uploaded to Submittal Exchange under the SCIR tab.

2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."

3. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, property surveys, and similar final record information. Documents are to be uploaded to Submittal Exchange under the Submittal tab.

4. Submit closeout submittals specified in individual Specification Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

5. Submit maintenance material submittals specified in individual Specification Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Contractor to provide a transmittal detailing all delivered maintenance materials and obtain Owner signature confirming delivery of such; a copy of transmittal with Owner’s signature shall be provided with Closeout submittals. Label with manufacturer's name and model number where applicable. All keys shall be tagged and labeled. Documents are to be uploaded to Submittal Exchange under the Closeout tab.

6. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

7. Submit a final Application for Payment according to Division 01 Section "Payment Procedures." Document to be uploaded to Submittal Exchange under the Pay App tab.

B. Inspection: No later than seven days after the Contract-scheduled date for final completion, Architect and Construction Manager will proceed with the final completion inspection. The Architect will review the final Certificate for Payment after the inspection or will notify the Contractor of the outstanding items that must be completed or corrected before the certificate will be processed.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete has been completed or corrected. The Owner and Architect and Construction Manager reserve the right to add items to the Substantial Completion and final completion inspection lists as long as it is part of the Contractor's work. Complete all Contract requirements prior to the final completion inspection to avoid any further re-inspection cost.

a. Costs for such reinspections and any costs for extension of the Architect's and Construction Manager's services will be deducted from sums otherwise due the Contractor.

1.6 SUBMITTAL OF PROJECT WARRANTIES

A. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual. Warranties for all equipment, materials, and systems on the Project are to start no sooner than the date of substantial completion. Provide extended warranties for all equipment, materials, and systems that may have been turned over to the Owner for its use regardless of the phased completion of the Project.

B. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit two digital media copies, PDF on thumb drive.

C. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Submit two paper copies, as listed above.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Remove surface dust and dirt from all vertical and horizontal painted surfaces. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

g. Sweep concrete floors broom clean in unoccupied spaces using sweeping compound that is compatible with new finishes.

h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.

j. Remove labels that are not permanent.

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

l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

p. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to condition acceptable to Owner and Construction Manager.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manual Format: Submit operation and maintenance manuals in the following format:

1. Two paper copies as listed below.
2. Two digital media copies, PDF format on thumb drive.

B. Prior to submission of paper copies and thumb drives as listed above, submit electronic files in PDF format for review and approval. If Submittal Exchange is used for Construction Document distribution, please upload O&M Manuals under the Submittals tab, Section 01 78 23. If the file is larger than 100MB, split said document into separate parts with a submittal cover sheet for each.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

4. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

B. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.5 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title Page: Include the following information:

    a. Subject matter included in manual.
    b. Name and address of Project.
    c. Date of submittal.
    d. Name and contact information for Contractor.

2. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

    a. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

3. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Operation Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.

    a. Product name and model number. Use designations for products indicated on Contract Documents.
    b. Manufacturer's name.
    c. Equipment identification with serial number of each component.
    d. Equipment function.
    e. Complete nomenclature and number of replacement parts.

2. Operating Procedures: Include the following, as applicable:

    a. Startup procedures.
    b. Routine and normal operating instructions.
    c. Regulation and control procedures.
    d. Normal shutdown instructions.
    e. Seasonal and weekend operating instructions.
    f. Special operating instructions and procedures.

3. Emergency Procedures: Include the following, as applicable:

    a. Instructions on stopping.
    b. Shutdown instructions for each type of emergency.
    c. Operating instructions for conditions outside normal operating limits.
    d. Special operating instructions and procedures.

4. Wiring diagrams.

5. Control diagrams.

6. Piped system diagrams.

    a. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

7. Precautions against improper use.

8. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

9. Include copies of all inspections/tests required in the individual technical specifications section.

B. Maintenance Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, manufacturers' maintenance documentation, maintenance and service schedules, spare parts list and source information, maintenance service contracts, repair materials and sources, and warranties and bonds, as described below.

1. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

2. Product Information: Include the following, as applicable:

    a. Product name and model number.
    b. Manufacturer's name.
    c. Color, pattern, and texture.
    d. Material and chemical composition.
    e. Reordering information for specially manufactured products.

3. Maintenance Procedures: Include manufacturer's written recommendations and the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Schedule for routine cleaning and maintenance.
    e. Repair instructions.

4. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

    a. Standard maintenance instructions and bulletins.
    b. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
    c. Identification and nomenclature of parts and components.
    d. List of items recommended to be stocked as spare parts.

5. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

    a. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
    b. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

6. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

7. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

8. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

9. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

    a. Include procedures to follow and required notifications for warranty claims.

1.7 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

    1. Do not use original project record documents as part of operation and maintenance manuals.

D. Submittals: Include copy of each product submittal approved by Architect.

    1. If the “As-Specified Verification Form” was used as the product submittal, include all pertinent product data as described in this Section.

E. Safety Data Sheets (SDS): Include copy of SDS for each product installed.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Miscellaneous record submittals.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Contractor to submit a full set of marked-up record drawings pertaining to their contract. Provide each drawing, whether or not changes and additional information were recorded. Comply with the following:

1. Submit one full size set of the original, marked-up record prints.

2. Submit two digital media copies, in color, in PDF format on thumb drives. PDFs to be saved and submitted as one file.

3. Prior to submission of paper copies and thumb drives as listed above, submit electronic files in PDF format for review and approval. If Submittal Exchange is used for Construction Document distribution, please upload Record Drawings under the Submittals tab, Section 01 78 39. If the file is larger than 100MB, split said document into separate parts with a submittal cover sheet for each.

B. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities.

1. Submit two paper copies of each submittal.

1.4 RECORD DRAWINGS

A. Record Prints: Architect will provide Contractor with one paper set of Contract Drawings at beginning of Work at no cost.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Revisions to routing of piping and conduits.
d. Revisions to electrical circuitry.
e. Locations of concealed internal utilities.
f. Changes made by Addendum.
g. Changes made by Architect’s Supplemental Instruction (ASI) forms.
h. Changes made by Change Order or Construction Change Directive.
i. Changes made following Architect's written orders.

3. Mark record sets with red, permanent marker.

B. Record Digital Data Files: Prepare a full set of digital data files of the Contract Drawings from the marked-up record prints.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Indicate name of Contractor.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record Digital Data Files: Organize digital data 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 digital data file.

1.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.6 RECORDING AND MAINTENANCE

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's, Construction Manager's and Owner's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Instruction in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 CLOSEOUT SUBMITTALS

A. Attendance Record: For each demonstration and training session, submit list of participants, subjects covered, and length of instruction time.

B. Demonstration and Training Video Recordings: Submit two copies of each demonstration and training session.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name of Architect.
c. Name of Construction Manager.
d. Name of Contractor.
e. Name of service representative providing training.
f. Name of instructor.
g. Date of video recording.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training for each system and for equipment not part of a system, as required by individual Specification Sections. Include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a. System, subsystem, and equipment descriptions.
   b. Operating standards.

2. Documentation: Review the following items in detail:

   a. Manuals.
   b. Warranties and bonds.

3. Operations: Include the following, as applicable:

   a. Startup procedures.
   b. Routine and normal operating instructions.
   c. Regulation and control procedures.
   d. Safety procedures.
   e. Normal shutdown instructions.
   f. Operating procedures for emergencies.
   g. Seasonal and weekend operating instructions.
   h. Special operating instructions and procedures.

4. Adjustments: Include the following:

   a. Noise and vibration adjustments.
   b. Economy and efficiency adjustments.

5. Troubleshooting: Include the following:

   a. Diagnostic instructions.
   b. Test and inspection procedures.

6. Maintenance: Include the following:

   a. Types of cleaning agents to be used and methods of cleaning.
   b. Procedures for routine cleaning
   c. Procedures for preventive maintenance.
   d. Procedures for routine maintenance.

7. Repairs: Include the following:

   a. Diagnosis instructions.
   b. Repair instructions.

1.7 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.

1.8 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.

1. Submit video recordings on a flash drive.

B. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 79 00

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress.
3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
4. Review areas where existing construction is to remain and requires protection.

1.6 SUBMITTALS, GENERAL

A. General: Submit all informational submittals required by this Section concurrently.

1.7 INFORMATIONAL SUBMITTALS

A. Predemolition Photographs or Video: Show existing conditions, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit photos or video recordings on thumb drive before Work begins. Include copy of key plan indicating each photograph's or video's location and direction.

1. Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modification.

2. Photographs: Provide high-resolution color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels.

    a. Name each image with date photograph was taken, location, and unique sequential number keyed to accompanying key plan in file name.

3. Video: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels.

    a. Name each video recording with date video recording was recorded, location, and unique sequential number keyed to accompanying key plan in file name.

    b. Begin narration of each video recording with Contractor's name, videographer's name, and location in Project.

        1) Describe scenes on video recording by audio narration.
        2) Confirm date and time at beginning and end of recording.

1.8 CLOSEOUT SUBMITTALS

A. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.9 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.10 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.11 WARRANTY

A. Existing Warranties: Remove, replace, patch, and restore materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. Existing EPDM membrane roofing, verify manufacturer in the field.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.12 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Record existing conditions by use of preconstruction photographs or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by demolition operations.

2. Inventory and record the condition of items to be removed and reinstalled. Provide photographs or video of conditions that might be misconstrued as damage caused by demolition operations.

F. Beginning selective demolition constitutes Contractor’s acceptance of conditions.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with utility companies.

2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain adequate ventilation when using cutting torches.

6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

9. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and restore items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning and restoring. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for Removal of Resilient Floor Coverings."

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Division 07 Sections for new roofing requirements.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 02 82 00 – ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Asbestos abatement quality assurance requirements, including personnel training and certification.

2. Work sequence requirements.

3. Personnel protective equipment.

4. Construction facilities and temporary controls for asbestos abatement, including containment barriers, engineering controls and decontamination facilities to ensure contamination from areas where abatement activities occur does not migrate to other areas.

5. Procedures for performing asbestos-containing material abatement, including (but not limited to) repair of existing flooring surfaces after completion of abatement.

6. Project monitoring and testing services for asbestos abatement, including requirements for air sampling and monitoring during asbestos abatement activities.

7. Requirements for transport and disposal of asbestos abatement waste materials by legal and appropriate means.

B. In accordance with 8 NYCRR 155 and ICR 56 asbestos testing has been performed in areas to be disturbed by scheduled renovation or demolition. Testing information is available for review at the Owner's administrative offices.

1.3 CODES AND REFERENCES

A. The following codes and references apply:

1. Asbestos Hazard Emergency Response Act - 40 CFR Part 763.

2. ASTM E 1368 – Standard Practice for Visual Inspection of Asbestos Abatement Projects.

3. National Emission Standards for Hazardous Air Pollutants; Asbestos-40 CFR 61, Subparts A and M.

4. New York State Industrial Code Rule 56 - 12 NYCRR Part 56 (ICR 56).

5. New York State Hazardous Wastes Management Regulations - 6 NYCRR 360 and 364.

6. OSHA

   a. 29 CRF 1910.134 – Respiratory Protection
   b. 29 CFR 1910.1001 – Asbestos
   c. 29 CFR 1926.1101 – Asbestos for Construction
   d. 29 CFR 1926.2 – Variances from Safety and Health Standards
   e. 29 CFR 1926.1200 – Confined Spaces for Construction

7. NYSDOH Asbestos Safety Program Requirements – 10 NYCRR Part 73

B. Failure to expressly refer to applicable code, regulation, standard, law and ordinance within Contract Documents does not imply that applicable regulatory requirements are not applicable to the Project.

1.4 DEFINITIONS

A. Refer to 12 NYCRR Part 56–2.1 for standard definitions. Additional terms are as follows:

1. Asbestos Abatement Work: Encapsulation, enclosure, repair, removal and disposal of asbestos-containing materials in accordance with all applicable codes, regulations, standards, laws and ordinances.

2. Dust and Debris: Visible particles, fragments, or chunks of material, large enough to have settled in the work area by virtue of their weight, that are presumed to have originated from the material abated by the response action, or from a fiber release episode.

3. Manual Removal: Removal work undertaken using only manually powered equipment such as scrapers, brushes, spud bars, etc. Manual removal does not include tools that are powered by electrical motors, compressed air, hydraulic fluid, combustion engines, etc.

4. Residue: Visible material which remains on the abated surface due to incomplete removal and cleaning.

5. Unremoved Material: Any material which was required to be removed by a response action but remains substantially undisturbed.

6. Visual Inspection: The activities associated with detecting the presence of visible residue, dust and debris, or unremoved material and verifying the absence thereof at the completion of a response action.

1.5 ACRONYMS

A. ACM: Asbestos Containing Materials.

B. HEPA: High Efficiency Particulate Air filter which is capable of trapping and retaining 99.97 percent of all mono-dispersed particles of 0.3 microns in diameter or larger.

C. NAD: No Asbestos Detected.

D. NOB: Non-friable asbestos materials embedded in flexible-to-rigid asphalt or vinyl matrices, including but not limited to flooring materials, adhesives, mastics, asphalt shingles, roofing materials and caulks.

E. PPE: Personal Protective Equipment.

F. RACM: Regulated Asbestos Containing Material.

G. TSI: Thermal System Insulation.

1.6 SUBMITTALS, GENERAL

A. Submit all action submittals and informational submittals (except Employee Training and Certification Documentation) required by this Section concurrently, with each item under separate cover. for items that are not required or applicable, contractor shall still submit cover page for such items and indicate not required or not applicable.

1.7 PRE_ABATEMENT SUBMITTALS

A. Product Data: For each type of product indicated. Submit MSDS and SDS for each type of chemical to be utilized. Include a summary table or narrative detailing the intended usage of each chemical/product.

1. Chemical mastic removers.
2. Encapsulants.
3. Fire Rated Caulking or Expansion Foams

B. Quality Control Submittals:

1. USEPA Notification, including all updates.

2. NYSDOL Notification, including all amended notifications.

3. Copy of ICR 56 Notification to Building Occupants

4. NYSDEC “Industrial Waste Hauler Permit”.

5. NYSDOL Asbestos Handling License.

6. Proposed Specific Variances from ICR 56.

7. Approved Specific Variances from ICR 56.

8. Work-plan identifying work areas, local exhaust system locations, areas of proposed decontamination units, waste trailers, temporary power/utility, barriers, boundaries of each regulated area, phasing/scheduling, and description of proposed sequencing of removals within each work area.

9. Pre-Fire plan.

10. List of proposed subcontractor.

11. New Flooring Warranty when chemical mastic removal methods are used. Contractor(s) electing to utilize chemical mastic removal methods shall provide, for all new flooring being applied over such areas, an flooring warranty equivalent to that of the new flooring warranty provided by the manufacturer.

1.8 POST-ABATEMENT SUBMITTALS

A. Notification of intended waste transporter and disposal site. Notification shall include draft manifest clearly identifying type of waste, transporter to be utilized, and disposal facility.

B. Waste Manifests for RACM and Trip Tickets for all other waste.

C. Results of any bulk sample analysis, area air sample analysis or OSHA compliance air sample analysis.

D. Copy of Project record and the supervisor Project log, including training and certification documentation for all workers and supervisors who performed any work on site during the course of the project. Training and certification documentation shall include a summary page listing all supervisors and workers utilized during the course of work. Summary shall include full names, social security numbers, and NYSDOL certification number for each individual.

E. Record drawings, which identify:

1. The extents of each abatement work area.
2. All locations where asbestos materials were removed.
3. Amount of asbestos materials removed, per location.
4. Where partial removal occurred, the amount of remaining asbestos material, per location.

1.9 QUALITY ASSURANCE

A. Qualifications:

1. Asbestos Abatement Firm:

a. Licensing: Possess valid Asbestos-Handling License issued by Commissioner of Labor of New York State.

b. Supervision: Full-time, on-site supervisor.

c. Personnel Training Requirements. Provide, to Project Monitor, valid training and certification documentation for new employees prior to employees beginning work.

1) Abatement Personnel: Successfully completed USEPA asbestos handler training course (initial or refresher) or USEPA approved asbestos contractor supervisor course (initial or refresher) within the previous 12 months, in accordance with 40 CFR 763. Acceptable documentation is the NYSDOH form DOH - 2832.

2) Abatement Supervisory Personnel: Successfully completed USEPA asbestos contractor/supervisor training course (initial or refresher) within previous 12 months, in accordance with 40 CFR 763. Acceptable documentation is the NYSDOH form DOH - 2832.

d. Personnel Certification Requirements:

1) Abatement Personnel: Possess valid asbestos handling certificate or valid asbestos supervisor certificate, issued by New York State Department of Labor in accordance with ICR 56.

2) Abatement Supervisory Personnel: Possess valid asbestos supervisor certificate issued by New York State Department of Labor in accordance with ICR 56.

2. Project Monitoring and Air Sampling Firm:

a. Employed by Owner with valid asbestos handling license issued by NYSDOL and employing individuals performing project monitoring and air sampling duties possessing asbestos handling certificates issued by NYSDOL for following categories:

1) Asbestos Air Sampling Technician.
2) Asbestos Project Monitor.

b. Contractor responsible for abatement shall not perform air sampling (except for OSHA compliance sampling) or project monitoring. Contractor shall notify Owner and Architect of any conflict of interest between itself and party responsible for project air sampling and monitoring.

3. Laboratories Performing Phase Contrast Microscopy (PCM) Air Sample Analysis (By Owner):

   a. Possess valid Environmental Laboratory Approval Program (ELAP) certificate issued by New York State Department of Health for category of Environmental Analysis/Air and Emissions, subcategory of Asbestos Fibers.

   b. Enrolled in American Industrial Hygiene Association's Proficiency Analytical Testing Program for PCM.

   c. Use National Institute for Occupational Safety and Health (NIOSH) Method 7400 entitled "Fibers" published in NIOSH Manual of Analytical Methods, 3rd Edition. Second Supplement, August 1987.

4. Laboratories Performing Transmission Electron Microscopy (TEM) Air Sample Analysis (By Owner):

   a. Possess valid Certificate of Accreditation issued by United State Department of Commerce's National Institute of Standards and Technology (NIST) for Airborne Asbestos Fiber Analysis.

   b. Use TEM methodology as required by Appendix A to Subpart E of the AHERA regulations 40 CFR 763.

5. Laboratories Performing Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM) Bulk Sample Analysis (By Owner):

   a. Possess valid Environmental Laboratory Approval Program (ELAP) certificate issued by New York State Department of Health for the category of Environmental Analysis / Solid and Hazardous Waste, subcategory of Asbestos in Friable Material and/or Non-Friable Material appropriate to analysis performed.

   b. Possess valid Certificate of Accreditation issued by United States Department of Commerce's National Institute of Standards and Technology (NIST) for Bulk Asbestos Fiber Analysis.

B. Regulatory Requirements: Comply with all federal, state, and local codes, laws, ordinances, standards and regulations applicable to asbestos abatement work, transport and disposal, including (but not limited to) standards referenced in "Codes and References" Article.

1.10 NOTIFICATIONS

A. Comply with the following notification requirements:

1. New York State Department of Labor: Submit notification to Division of Safety and Health Asbestos Control Bureau as required in ICR 56 such that notification is received not fewer than 10 days prior to commencement of Project. Include payment of all related notification fees and other notification expenses.

2. United States Environmental Protection Agency (USEPA): Submit notification to USEPA at following address such that notification is received not fewer than 10 days prior to commencement of Project:

Asbestos NESHAP Coordinator
Air & Waste Management Division
USEPA Region 2
26 Federal Plaza
New York, New York 10278

3. Building Occupant Notification: Provide notification to building occupants not fewer than 10 days prior to mobilization or start of preparation work. Ensure notifications are posted in accordance with ICR 56, and remain in place. Contractor shall be responsible for maintaining and replacing notifications if damaged or removed.

1.11 VARIANCES

A. Variances from ICR 56: Use any Applicable Variances issued by New York State Department of Labor (NYSDOL) and any Specific Variances issued by NYSDOL and approved by the Owner and Architect. Remain solely responsible for complying with provisions of variances used.

1. Obtain any and all variances from ICR 56 which may be necessary or desired to perform the Work.

2. Contractor-Obtained Variances: Provide copies of all Petitions for Variance requested by Contractor or subcontractors to Owner, Construction Manager and Architect prior to submission of Petition for Variance to NYSDOL.

a. Comply with following requirements for all Petitions for Variance:

1) Provide adequate protection from contaminating areas outside work area.

2) Provide adequate relief from air sampling requirements, including relief from air sampling requirements on days when no active abatement work occurs.

3) Conform to overall design criteria for Project.

4) Protect facility from damage as result of conditions of Petition for Variance.

b. Contractor retains responsibility for providing all additional conditions, equipment, and other provisions imposed by NYSDOL as part of NYSDOL acceptance of Petition for Variance.

c. Extensions of time for performance of asbestos abatement work will not be granted to compensate for NYSDOL review of Contractor-obtained variances.

d. Contractor is responsible for all fees and expenses related to submission of any Petitions for Variance.

1.12 PROJECT CONDITIONS

A. Project/Site Access Limitations: Restrict access to all work areas. Immediately report any access by unauthorized individuals to Owner and Project Monitor.

1.13 PRE-FIRE PLAN

A. Pre-Fire Plan, indicating primary and secondary emergency escape routes from the work area, local exhaust system locations, decontamination units, waste-out units, access tunnels, temporary facilities, location of fire extinguishers, and location of negative air emergency disconnect switch (if required).

B. Plan shall be reviewed with all personnel to enter the work area and shall be posted in the decon area as well as in the work area.

1.14 ASBESTOS LOGS/PROJECT RECORD

A. Maintain a project log as part of ICR 56 during the abatement phase of the work with all information required by ICR 56 and as described herein.

B. Make project log available on site at all times when a project as defined by ICR 56 is active.

C. At a minimum, comply with ICR 56 requirements and as follows:

1. Asbestos Abatement Contractor Project Log (Supervisor's Daily Project Log): As per 12 NYCRR 56-7.3.

2. Non-abatement Asbestos Contractor responsible for Air Sampling (Air Sampling Log): As per 12 NYCRR 56-4.5.

3. Non-abatement Asbestos Contractor responsible for Project Monitoring (Project Monitoring Log):

    a. Name of the firm and the certified Project Monitor(s) performing project monitoring duties.

    b. Dates of project.

    c. Observations, per work area regarding:

        1) The stage of completion of the work.
        2) Schedule concerns.
        3) Work that may be out of compliance with project documents or pertinent asbestos regulations.
        4) Asbestos abatement contractor corrections to barriers/required cleaning of areas outside of the work area.
        5) Removal of work area containment by asbestos abatement contractor.
        6) Hidden conditions.
        7) Other relevant information.

    d. Information about potential change orders or work performed for which the asbestos abatement contractor contends is outside the scope of work.

    e. Coordination with asbestos abatement contractor or others to resolve identified issues.

    f. Resolution of identified issues.

    g. Project Monitor final visual inspections and final clearance.

    h. At a minimum, document project observations and other information by work area and day with additional entries to accurately describe the project status.

4. Where the same non-abatement asbestos contractor is responsible for both air sampling and project monitoring, one project log containing all required components of the Air Sampling Log and the Project Monitoring Log shall suffice.

D. Project Record: At all sites where there is an active project, a project record is required as per ICR 56-3.4 (a) (2).

1. The asbestos abatement contractor shall act as the Owner's representative as it relates to responsibility for the following portions of the Project Record required by ICR 56-3.4 (a) (2):

    a. Copies of licenses of all entities involved with the project.
    b. Copies of all supervisors and handler certificates, including a summary sheet listing all individuals utilized on the project.
    c. Copies of all supervisors and handlers training certificates (DOH-2832).
    d. Copies of notifications and amendments.
    e. Copies of all variances, amendments and re-openings being used for the project.

f. A copy of all air sampling results, including method of analysis, by date for the entire asbestos project, organized by regulated abatement work area.
g. The supervisor's daily log with entry/exit logs organized by date.
h. All bulk sample data including all asbestos inspections and surveys completed for affected portions of the building, structure and work site.

2. The asbestos contractor performing air sampling on this Project shall act as the Owner's representative as it relates to responsibility for the following portions of the Project Record required by ICR 56-3.4 (a) (2):

a. A copy of the air sample log if the Air Sampling Technician is on site. If the Air Sampling Technician is not on site, a copy of the air sample log shall be supplied within 24 hours of the request to produce a copy thereof.

3. The asbestos contractor performing project monitoring on this project shall act as the Owner's representative as it relates to responsibility for the following portions of the Project Record required by ICR 56-3.4 (a) (2):

a. A copy of the Project Monitor's daily logs during abatement (if a Project Monitor is used on the project).

1.15 SEQUENCING AND SCHEDULING

A. Timing of Abatement Preparation and Removal Operations:

1. Coordinate abatement preparation and removal work to allow for removal or demolition work by other entities, prior to commencing abatement preparation or removal activities, where such activities will not disturb ACM.

2. Where items scheduled to be removed, relocated, or demolished by others will impact ACM, coordinate with other entities regarding temporary relocation of these items during abatement activities. Work that will disturb ACM must be performed by the Contractor responsible for abatement activities.

B. Completion: Complete Asbestos Abatement Work in accordance with construction schedule requirements specified in Division 01 Section "Multiple Contract Summary" with each phase considered distinct and separate for purpose of schedule and substantial completion.

1. Substantial Completion of a phase occurs when all of the following occur:

a. All components of the phase have passed visual inspection by Project Monitor.
b. Satisfactory clearance air sampling is achieved for each portion of the phase.
c. All containment barriers have been removed.
d. Areas are returned to Owner.

2. If Contractor fails to achieve substantial completion within specified schedule requirements, all costs associated with extension of schedule, including (but not limited to) Architect time and expenses, air sampling costs, project monitoring costs, direct costs incurred by Owner, and costs to accelerate sample analysis shall be deducted from final payment.

C. Restrictions on Working Hours: Schedule work only during regular working hours, as established for Project. Do not use overtime or multiple shifts with "overtime" defined as any time in excess of 8 hours in single day, work on weekends, or work on holidays.

D. Changes in Working Hours: Advise Project Monitor of any changes in hours or days which Contractor will be on site, at least 24 hours prior to change. Contractor retains all liability resulting from Contractor's failure to make required notification.

E. Security: Contractor shall maintain the security of the work areas for which they are performing work in, have modified the existing facilities, or are utilizing for staging area.

PART 2 - PRODUCTS

2.1 NON-ASBESTOS PRODUCTS

A. No products containing asbestos may be used on this project, including but not limited to the following: for temporary construction, work area containment, restoration or renovation work.

2.2 EQUIPMENT

A. Respirators: Provide respirators jointly approved as acceptable for protection by National Institute for Occupational Safety and Health (NIOSH) under provisions of 30 CFR Part 11.

1. Supply and use respirators in accordance with 29 CFR 1910.134 and 29 CFR1926.1101.
2. Provide respirators, filters and ancillary supplies as required for employees and authorized visitors.
3. Account for hazards other than asbestos in respirator selection.

B. Protective Clothing: Provide disposable protective clothing complying with requirements of 29 CFR 1926.1101 that is disposed of after one use. Provide disposable clothing as required for employees and authorized visitors.

C. Asbestos Abatement Construction Facilities and Controls: Provide all materials and equipment in compliance with requirements of:

1. NYS Industrial Code Rule 56.
2. 29 CFR 1926.1101.

D. Project Monitoring and Testing Services Equipment (By Owner):

1. Transmission Electron Microscopy (TEM) Air Sampling Cassettes: Use commercially available 25 mm or 37 mm cassettes.

a. Filter Media: Use sample collection filters which are either:

1) Polycarbonate with pore size less than or equal to 0.4 micrometers; or
2) Mixed cellulose ester having pore size less than or equal to 0.45 micrometers.

2. Phase Contrast Microscopy (PCM) Air Sampling Cassettes: Use commercially available 25 mm cassettes.

   a. Filter Media: Use mixed cellulose ester sample collection filters with pore size of 0.8 micrometers.

3. Use only new cassettes. Reloaded cassettes are not acceptable.

2.3 ENCAPSULANTS

A. Encapsulants shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvent.

2.4 FIRE RATED SEALANTS

A. All sealants to be used shall meet minimum 2-hour fire rating as per ASTM E-814.

B. Sealant shall be either a polyurethane based expansion foam or a silicone based caulk system.

1. Fire-rated expansion foams shall be manufacturer-colored pink so as to identify its rating. Acceptable products include:

   a. ABESCO FP200 Fire Rated Expansion Foam,
   b. FlameShield Fire Rated Expansion Foam, or
   c. Pyroplex-Fire Rated Expanding Foam.

2. Fire-rated caulking materials are not required to be manufacturer-colored pink. Acceptable products include:

   a. DAP Fire-Stop Fire Rated Silicon Sealant, and
   b. Hilti CP 601S Elastomeric Firestop Sealant.

3. Fire-rated caulking may require the use of backer material per manufacturer instructions.

C. All sealants shall be applied per manufacturer instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 GENERAL REQUIREMENTS

A. The Contractor shall not permit eating, smoking, drinking, chewing or applying cosmetics in the regulated area.

3.3 PROTECTION

A. Provide personal protective equipment as required by 29 CFR 1926.1101 at no cost to employees or authorized visitors.

B. Institute respirator program in accordance with 29 CFR 1910.134 (b), (d), (e) and (f).

C. Use protective clothing and respirators whenever asbestos containing materials are being disturbed, abated, cleaned up, containerized or stored in vehicle or container used to transport waste to landfill.

D. Institute medical surveillance program in accordance with 29 CFR 1926.1101 for all employees performing or supervising asbestos handling work, entering work area containment, or using respirator.

3.4 PREPARATION

A. Perform all preparation work in accordance with Industrial Code Rule 56 and 29 CFR 1926.1101.

B. Do not begin asbestos abatement activities until all of following have occurred:

1. Monitoring Firm has completed background air sampling as required.
2. All preparation work, including installation of decontamination enclosure systems and engineering controls (ex. negative air pressure equipment, etc.) is complete.
3. The Project Monitor has inspected containment area.
4. The Project Monitor has given written authorization to proceed.

C. Decontamination Facilities And Practices

1. The Contractor shall establish a decontamination area in accordance with ICR 56 for the decontamination of employees, material and equipment. The Contractor shall ensure that employees enter and exit the regulated area through the decontamination area.

2. Decontamination Facility – Remote

a. Construct decontamination facilities in accordance with ICR 56 and as follows:

1) Personal decontamination facility minimum requirements:

a) Where remote decontamination facilities are allowed, construction of the decontamination facility shall include an additional airlock after the equipment room and which shall include a lockable door. An additional airlock is required at the entrance to the containment / regulated area and shall include a lockable door.

2) Waste decontamination facility minimum requirements

a) Where remote decontamination facilities are allowed in small and large work areas shall have a washroom constructed between the work area and airlock.

D. Large and Small Asbestos Work Area Preparation - Interior Work:

1. Ensure occupants vacate work area prior to starting preparation. Post caution signs at all approaches to asbestos abatement work area.

a. Do not conduct asbestos abatement activities in occupied buildings. Provide exits from isolated portion of building that do not pass through occupied portions of building. Physically separate and seal ventilation systems passing through occupied portions of building at isolation barrier.

1) "Building": As defined by New York State Education Department, references to "building" in this Section means wing or major section of structure that can be completely isolated from other portions of the structure with sealed non-combustible construction.

b. Where interior abatement occurs, isolate wing or major section of building from occupied portions of building with sealed isolation barriers constructed of non-combustible materials. Provide exits from isolated portion of building that do not pass through occupied portions of building. Physically separate and seal ventilation systems passing through occupied portions of building at isolation barrier.

c. Do not remove isolation barriers until satisfactory TEM clearance sampling results have been obtained as required by New York State Education Department.

2. Shut down and secure electric power to asbestos abatement work area. Provide temporary power and lighting in accordance with all applicable codes and requirements of project schedule.

    a. Ensure all power to asbestos abatement work area from outside area passes through ground-fault interrupter at source of power.

    b. Confirm which electrical circuits that pass through the asbestos abatement work area, but do not serve the asbestos work area, cannot be shut down.

    c. If electrical circuits, machinery or other electrical systems pass through, but do not service the work area and cannot be shut down, isolate, protect and label such systems as per ICR 56-7.7 (a).

    d. Contractor's competent person shall be responsible for ensuring all electrical is properly shut down and secured.

3. Install or construct a personal decontamination enclosure system fully complying with ICR 56-7.5.

    a. Secure personal decontamination enclosure system to prevent unauthorized entry.

    b. Remote decontamination system enclosures shall only be used when allowed by ICR 56, or if a petition for variance from ICR 56 is accepted by Owner and Architect and approved by NYSDOL.

        1) Confirm that remote decontamination enclosure system location will allow access to regulated work areas without adversely affecting use of the building by Owner or other entities.

        2) Provide additional airlocks as required by ICR 56.

4. Shut down and isolate heating, ventilating and air conditioning systems.

5. Pre-clean and remove all movable objects. Pre-clean all fixed objects and other items to remain and enclosed with two distinct and separate layers of plastic sheeting. Pre-clean asbestos abatement work area.

6. Install isolation barriers in accordance with ICR 56-7.11.

7. Install negative pressure equipment fully complying with ICR 56-7.8.

    a. Provide a manometer for all OSHA Class I work areas.

        1) Maintain a minimum of –0.02 column inches of water pressure differential relative to pressure outside the work area.

        2) Document the manometer reading at least twice per work shift.

3) At a minimum, provide four air changes per hour or as modified by ICR 56 or a specific variance for particular materials, containment or other requirements.

8. Maintain emergency and fire exits from asbestos abatement work area in accordance with all applicable codes.

9. Install or construct waste decontamination enclosure system fully complying with ICR 56-7.5 and secure to prevent unauthorized entry.

   a. Waste decontamination system enclosures shall be constructed and functional prior to completion of work area preparation.

   b. Where a remote personal decontamination system enclosure is allowed comply with the following additional requirements:

      1) Small and Large Size Regulated Abatement Work Areas: Construct an additional chamber attached to the regulated work area for use in conjunction with the existing airlock as a contiguous waste decontamination enclosure.

      2) Minor Size Regulated Abatement Work Area: No additional chamber required.

E. Negative Pressure Tent Enclosures:

1. Negative pressure tent enclosures may be used in the following circumstances:

   a. Any amount of gross abatement of exterior and interior non-friable ACM.
   b. Any amount of glovebag abatement of friable TSI.
   c. Gross abatement of Minor or Small amounts of friable ACM.

2. Construct negative pressure tent regulated abatement work area enclosures as per ICR 56-7.11 (f) (1).

F. Exterior Project Removal of Non-friable ACM Roofing, Siding, Caulking, Glazing Compound, Transite, Tars, Sealers, Coatings, and Other NOB ACMs:

1. Perform preparation work in accordance with ICR 56-11.6.

2. Ensure that the materials are maintained in a non-friable condition and that debris does not fall into the building. Contractor shall be responsible for any additional provisions required by failure to comply with these provisions.

G. Removal of Ceilings and Components:

1. Where non-ACM suspended ceilings and components exist below friable ACM:

a. Complete all preparation work, including all plasticizing, decontamination enclosure construction and instituting negative pressure, up to the suspended ceiling.

b. Remove ceiling tiles and components and dispose or decontaminate as required.

c. Mounted objects or fixtures shall be disposed of or decontaminated and supported in place if scheduled for reuse.

d. Complete preparation work above ceiling.

H. Plasticizing Floors, Walls and Ceilings:

1. Plasticize and seal floors, walls and ceilings as per ICR 56-7.11 or as modified elsewhere in ICR 56 or in accordance with a specific variance from ICR 56 which is approved by NYSDOL and accepted by the Owner and Architect.

I. Pre-Abatement Settling Period: For all Small and Large size regulated abatement work areas where negative pressure equipment is required, upon completion of construction of all isolation barriers and decontamination system enclosures, including the establishment of the negative air system and prior to beginning actual abatement activities, at a minimum, allow 4-hour settling period to insure that barriers remain intact and secured to walls and fixtures.

3.5 ABATEMENT PROCEDURES

A. Perform all asbestos abatement work in accordance with ICR 56 and 29 CFR 1926.1101.

B. Work Area Entry and Exit Procedures: All personnel enter and exit asbestos abatement work area through personal decontamination enclosure system. Post pertinent regulations, personal protection requirements, work area entry and exit procedures, and emergency procedures in clean room.

1. Entry/Exit Log: Ensure all persons sign Entry/Exit Log for each entry and exit. Include at least the following information in Entry/Exit Log:

a. Project name.

b. Building name.

c. Unique work area description.

d. Date.

e. Statement that signature acknowledges review and understanding of posted regulations, personal protection requirements, work area entry and exit procedures, and emergency procedures.

f. Printed name, signature, social security number, NYS asbestos certificate number, entry time and exit time for each individual.

2. Asbestos Abatement Work Area Entry:

   a. Initially proceed to clean room and remove all clothing and put on disposable coveralls, head covering, foot covering and gloves.

   b. Put on NIOSH-approved respiratory protection appropriate to airborne concentrations of asbestos.

   c. Use clean respirators and protective clothing for each separate entry into asbestos abatement work area.

   d. Inspect respirators prior to each use and test for proper seal using quantitative or qualitative fit checks.

   e. Proceed through personal decontamination enclosure system to equipment room and collect necessary tools and put on any additional clothing before entry into asbestos abatement work area.

3. Asbestos Abatement Work Area Exit:

   a. Before leaving asbestos abatement work area, remove gross contamination from outside of respirators and protective clothing on all personnel by brushing, wet cleaning, and HEPA vacuuming.

   b. Proceed to equipment room.

   c. Remove all disposable coveralls, head covering, foot covering and gloves and deposit into labeled containers for disposal.

   d. Store reusable contaminated clothing, footwear, head gear and gloves in equipment room when not in use in asbestos abatement work area.

   e. Still wearing respirators, enter shower for decontamination.

   f. Proceed to clean room and put on clothing.

4. Remote Decontamination Procedure Modifications: If remote decontamination enclosures systems are allowed by ICR 56, modify asbestos abatement work area entry and exit procedures as follows:

   a. Designate a pathway from the regulated abatement work area to the personal decontamination system or next regulated abatement work area that is cordoned off and has appropriate signage as per ICR 56.

   b. Confirm that location of designated pathway will not adversely affect the operations of the Owner or other entities.

c. Put on two suits (coveralls, head covering and foot covering) when putting on disposable clothing.

d. Provide attached airlock for each remote asbestos abatement work area and at the entrance to the equipment room of the remote decontamination enclosure system.

e. Prior to leaving asbestos abatement work area, HEPA-vacuum and/or wet wipe outer suit, enter airlock, remove outer suit, don a clean set of protective clothing.

f. Where provisions of specific variance vary from above, most stringent requirements apply.

C. Asbestos Removal – General Requirements:

1. Wetting Requirements: Wet asbestos materials frequently with amended water, and allow sufficient time for penetration to occur prior to abatement activities.

2. Handling: Directly bag or drop asbestos material on detachment from substrate into flexible catch basin for subsequent bagging.

a. Chutes: Use dust tight, enclosed, inclined chutes for asbestos material dropped distances greater than 10 feet.

b. Handling Large Components: Wrap large components, removed intact, in two: layers of plastic sheeting, secure and make airtight with tape.

c. Sharp-Edged Components: Place asbestos waste material with sharp-edged components that may tear plastic bags or sheeting into hard wall containers and seal airtight.

3. Daily Cleanup Procedures: Perform cleanup of loose asbestos material whenever enough loose asbestos material has been removed to fill single leak-tight container of type suitable for material properties. Perform cleanup at least once per day prior to close of each working day. Keep asbestos material wet until cleaned up.

D. Equipment and Waste Container Decontamination and Removal Procedures:

1. Wet clean or HEPA-vacuum external surfaces of contaminated containers and equipment in asbestos abatement work area before moving items into waste decontamination enclosure system airlock. Do not enter airlock.

2. Remove these contaminated items from airlock using individuals stationed in washroom during waste removal operations.

3. Once in waste decontamination enclosure system, clean external surfaces of contaminated containers and equipment and clean equipment second time by wet cleaning.

4. Dry any excessive pooled or beaded liquid from cleaned containers of asbestos material and equipment, place in uncontaminated plastic bags or sheeting as required by characteristics of item, and seal airtight.

5. Move clean re-containerized items into airlock leading to holding area. Do not enter airlock until waste removal is finished for that period.

6. Provide individuals dressed in clean personal protective equipment that has entered from uncontaminated areas to move containers and equipment from airlock and place in holding area.

7. Place cleaned containers of asbestos material and equipment in watertight carts with doors or tops that close and can be secured. Hold these carts in holding area until removal. Wet-clean or HEPA-vacuum carts at least once each day.

8. When waste decontamination enclosure is part of personal decontamination enclosure, do not remove waste during shift change or when otherwise occupied.

E. Asbestos Removal – Additional Requirements:

1. Multiple Abatement within a Single Regulated Abatement Area: Perform abatement of multiple materials from the same regulated work area as per ICR 56-8.6.

2. Non-Friable Flooring and/or Mastic Removal:

a. Completely remove flooring and mastic from the substrate. Mastic removal is incomplete if any residual floor tile mastic can be removed from the surface, edges, corners, pits or cracks.

b. Concrete Substrate Mastic Removal Options:

1) Where mechanical/manual methods are utilized, contractor must repair damage to the concrete substrate caused by removal and patch and repair existing floor substrate as required, providing smooth, level surface acceptable to receive new flooring materials.

2) Where chemical mastic removal agents are used:

a) Prevent odors and/or vapors from migrating to interior spaces. Provide additional air changes as necessary to prevent migration.

b) Prevent chemical mastic removal agents from soaking into cracks or adjacent materials.

c) Completely neutralize and clean all residual chemical mastic removal agents from the substrate and adjacent surfaces.

d) Comply with manufacturer's recommendation for use and cleanup.

e) Contractor is responsible for the disposal of and any additional requirements or costs related to waste generated by the mastic removal activities.

f) Work may be performed in accordance with ICR 56-11.7.

g) Use of chemical mastic removal methods voids new flooring manufacturer's warranty. Contractor(s) electing to utilize chemical mastic removal methods shall provide an equivalent warranty to that of the new flooring warranty.

3) Where soy-based chemical mastic removal agents are used, they shall meet the following minimum standards:

a) Hazardous Materials Identification System (HMIS) rating (HMIS III) not exceeding: Health – 0, Flammability – 1, Physical Hazard – 0.

b) National Fire Protection Association (NFPA) rating not exceeding: Health Hazard – 0, Flammability – 1, Instability – 0.

c) Chemical mastic removal agents limited to soy based mastic removal agents to reduce the possibility of indoor air quality issues during, or subsequent to, application of chemical mastic removal agents.

d) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, Franmar Chemical, Inc.; BEAN-e-doo Mastic Remover and AG Environmental Products, LLC; SoyGold 1100 Solvent.

e) Mechanical/manual methods may be used in lieu of soy based chemical mastic removers at the contractor's discretion.

4) Where petroleum-based chemical mastic removal agents are used, they shall meet the following minimum standards:

a) Hazardous Materials Identification System (HMIS) rating (HMIS III) not exceeding: Health – 1, Flammability – 2, Physical Hazard – 0.

b) National Fire Protection Association (NFPA) rating not exceeding: Health Hazard – 0, Flammability – 1, Instability – 0.

c) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, Sentinel Products, Inc.; 747 Fresh Scent Mastic Remover and ARAMSCO; Chemsafe 100 Low Odor Mastic Remover.

d) Mechanical/manual methods or soy-based mastic remover may be used in lieu of petroleum-based mastic removers at contractor's discretion.

5) Coordinate with flooring Installer to ensure removal of existing flooring is provided in manner acceptable for installation of new flooring materials, including coordination of requirements for abrasive removal of existing flooring adhesives and mastics.

6) Patch and repair existing floor substrate as required providing smooth, level surface acceptable to receive new flooring materials.

a) Applicator Qualifications: Ensure patching and repair materials are applied by applicator experienced in application of patching and repair materials and with at least 3 successfully completed applications of similar materials in similar applications.

b) Coordination: Review proposed patching and repair materials with flooring Installer to ensure compatibility between new flooring materials and patching and repair materials.

c) Levelness Tolerances: Apply floor patching and repair materials to provide levelness of floor substrate within at least 1/4 inch in 10 feet, unless more stringent levelness recommended or required by finish flooring manufacturer. Coordinate with flooring Installer prior to applying patching and repair materials to confirm required levelness tolerances.

7) Patching Floor Substrates Abated by Mechanical Means:

a) Flash Patching over Floor Substrates Abated by Mechanical Methods: Apply Portland cement-based self-drying cementitious flash patching material similar to Ardex Engineered Cements; ARDEX Feather Finish, to damaged areas with 1/8 inch or less depressions.

b) Patching over Floor Substrates Abated by Mechanical Methods: Apply Portland cement-based self-drying cementitious patching material similar to Ardex Engineered Cements; ARDEX SD-P, to damaged areas with depressions over 1/8 inch deep.

c) Self-Leveling over Floor Substrates Abated by Mechanical Means: Apply Portland cement-based cementitious self-leveling material similar to Ardex Engineered Cements; ARDEX K 15 Self-Leveling Underlayment Concrete, to large damaged areas where flash-patching and patching described above cannot provide smooth, level surface acceptable to receive new flooring materials.

8) Patching Floor Substrates Abated by Chemical Methods: Apply a high strength cement and powdered polymer self-leveling floor underlayment material. Product to meet the following performance requirements:

a) Compatible with application over chemical abatement residues.

b) Thickness of application: minimum thickness of 1/8 inch up to maximum thickness of 2 inches. Thickness over 2 inches to be acheiveable with the addition of aggregate.

c) Compressive Strength (ASTM C 109/mod – Air cure only): 4100 psi at 28 days.

d) Flexural Strength (ASTM C 348): 1000 psi at 28 days.

e) Flammability(ASTM E84): Flame Spread -0-, Fuel Contribution -0-, Smoke Development -0-.

f) Walkable: 3 hours at 70 deg F.

g) Products complying with above specified requirements include Ardex Engineered Cements; ARDEX LU-100 Self-Leveling Flooring Underlayment.

c. Wood Substrate:

1) ACM Mastic: Unless otherwise indicated, remove and dispose of the wood underlayment in its entirety as asbestos containing or contaminated material. Removal includes all fasteners, felts, etc.

2) Non-ACM Mastic: Unless otherwise indicated, the wood underlayment and residual mastic shall remain in place after removal of the ACM floor tile

3. Removal of ACM Ceilings, Walls or Other Components that Expose Areas Beyond:

a. Where removal of an ACM component or system, e.g. ceiling or wall, may expose openings to adjacent areas:

1) Complete all preparation work, including, plasticizing, installation of decontamination systems and instituting negative pressure.

2) Carefully remove the component or system at the perimeter and penetrations prior to gross removal.

3) Clean the area around any and all exposed openings.

4) Install critical barriers on all exposed openings.

5) If any additional openings are exposed during gross removal, immediately stop work, clean the area around the exposed opening and install critical barriers.

4. Glovebag Removal Operations:

a. Glovebag removals are limited to non-planar surfaces, such as pipes or ducts, unless a variance is granted by the NYSDOL and accepted by the Owner and Architect.

b. All glovebag removal work shall be performed within a negative pressurized regulated abatement work area as per ICR 56-7.11 (f) (1).

c. Perform all glovebag removal work in accordance with ICR 56-8.4 (a).

d. When abating pipe or duct insulation, the pipe or duct insulation diameter worked shall not exceed one half the bag working length.

5. Exterior Work Area Removal of Non-Friable ACM Roofing, Siding, Caulking, Glazing Compound, Transite, Tars, Sealers, Coatings, and Other NOB ACMs

a. All removal work shall be performed using manual methods, except for roof removal using rotating blade cutters.

b. In no event shall methods be used that may render the ACM friable.

c. All removal shall be performed using wet methods.

d. Work to the building face, including windows, where not removed within tents, whenever possible, ACM shall be removed with an asbestos handler using a HEPA vacuum to capture small pieces of the ACM as it is dislodged. The vacuum hose shall be within four inches of the material being removed.

e. Asbestos containing materials shall not be allowed to accumulate in the work area or the drop cloth.

f. Asbestos-containing roofing material shall not be dropped or thrown to the ground, but shall be lowered to the ground via covered, dust-tight chute, crane, hoist or other approved method.

g. In lieu of using an exterior chute, 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.

3.6 WORK STOPPAGE CRITERIA

A. Work Stoppage Level Criteria During Abatement:

1. At any time during abatement activities, stop work immediately for inspection and repair of barriers if:

a. Air samples collected outside of work area indicate airborne asbestos fiber concentrations at or above 0.01 fibers per cubic centimeter, or background level, whichever is greater;

b. Visible emissions are observed outside a regulated abatement work area; or

c. Water leaks are observed outside a regulated abatement work area.

2. Work stoppage due to elevated air results shall require:

    a. Inspection and repair of barriers and negative air ventilation systems as necessary.

    b. Clean up of surfaces outside of the regulated abatement work area using HEPA-vacuums and wet-cleaning methods prior to resumption of abatement activities.

    c. A summary of the elevated results, clean up activities, the results of barrier and negative air system inspections including any necessary repairs, to be documented in the asbestos abatement contractor supervisor's daily project log.

    d. Work methods shall be altered accordingly to reduce fiber concentrations to acceptable levels.

3. Work stoppage due to visible emissions or water leaks outside a regulated abatement work area shall require:

    a. Isolate HVAC systems.

    b. Isolate uncontaminated areas.

    c. Install critical barriers.

    d. Negative air pressure equipment ventilation.

    e. All accumulations of asbestos waste material shall be containerized and removed.

    f. All surfaces in the regulated abatement work area shall be wet-cleaned using rags, mops and sponges.

    g. After the first cleaning, at least twelve hours shall be allowed for asbestos to settle. Thereafter, all objects and surfaces in the regulated abatement work area shall be HEPA vacuumed and wet-cleaned.

    h. All remaining contaminated equipment and containerized waste shall be removed from the regulated abatement work area.

    i. Clearance air sampling shall be conducted, as per the schedule for air sampling and analysis.

3.7 FINAL CLEANING AND CLEARANCE PROCEDURES

A. Post-Abatement Cleaning: Ensure negative pressure ventilation units remain in continuous operation during settling periods and cleaning. Do not proceed to subsequent stage of cleaning; sheeting removal or clearance air sampling until cleaning has been properly completed. Following completion of all stripping work, HEPA-vacuum and wet clean surfaces from which asbestos material has been removed.

1. Inspection: Provide for Project Monitor to visually inspect entire asbestos abatement work area at completion of each cleaning to determine whether removal and cleaning has been properly completed.

    a. Any debris and/or residual material in asbestos abatement work area shall be assumed to be asbestos containing material.
    b. Cleaning not considered properly completed until debris and residue has been cleaned or removed.

2. First Cleaning: Wet clean all surfaces in asbestos abatement work area first using rags, mops and sponges.

3. Encapsulant Use During Cleanup: After first cleaning, prior to first sheeting removal and after asbestos abatement work area has been rendered free of visible residue, apply thin coat of encapsulation agent to any surfaces in asbestos abatement work area not subject to removal or other remediation activities. Do not apply encapsulant to any surface involved in asbestos removal or other remediation activities prior to obtaining satisfactory clearance air monitoring results.

4. First Sheeting Removal: After first cleaning, observe a settling period equal to or greater than that required by ICR 56-9.1 (f) before continuing. Remove cleaned exposed barrier layer of plastic sheeting from walls and floors. Keep windows, doors, HVAC system vents and all other openings sealed. Keep in place and use decontamination systems.

5. Second Cleaning and Sheeting Removal: Then HEPA-vacuum or wet clean all objects and surfaces in asbestos abatement work area. Remove remaining plastic on walls and floors only. Keep all windows, HVAC system vents and all other openings sealed.

6. Third Cleaning After second cleaning, observe a settling period equal to or greater than that required by ICR 56-9.1 (f) before continuing with HEPA-vacuuming and then wet cleaning all surfaces in asbestos abatement work area.

7. Removal of Waste, Tools and Equipment: Remove from asbestos abatement work area and from holding area and decontaminate tools and equipment.

8. Where an exemption from multiple cleaning and sheeting removal exists in ICR 56-9.1 (e) or specific variance granted by NYSDOL and accepted by the Owner and Architect, modify cleaning and sheeting removal to reflect that in ICR 56-9.1 (e) or specific variance.

B. Supervisor Post Abatement Visual Inspection:

1. After all required abatement and cleanings, the asbestos abatement contractor supervisor shall perform a visual inspection for completeness of abatement and cleaning.

2. The asbestos abatement supervisor visual inspection must determine that abatement and cleaning have been properly completed as per the project documents and all pertinent regulations prior to commencement of the Project Monitor visual inspection.

3. Contractor supervisor shall document in the Project Log that abatement and cleaning have been satisfactorily completed in accordance with project documents and all pertinent regulations.

C. Project Monitor Visual Inspection:

1. After all required abatement, cleanings and the asbestos abatement contractor supervisor visual inspection, the Project Monitor shall perform a visual inspection for completeness of abatement and completeness of cleanup as per project documents and the current ASTM E 1368.

2. Upon satisfactory completion of the required Project Monitor visual inspection, an entry shall be made into the asbestos abatement contractor supervisor's daily log by both the supervisor and the Project Monitor, detailing the findings of the visual inspection.

3. The full name and NYSDOL asbestos handling certificate number of the Project Monitor shall also be documented in the supervisor's daily log.

D. Clearance Air Monitoring (By Owner):

1. After Project Monitor has performed visual inspection and provisionally determined that removal and cleaning have been properly completed, Project Monitor shall conduct clearance air monitoring.

   a. Removal and cleaning not considered properly completed until asbestos abatement work area has achieved satisfactory clearance air sampling in accordance with this Section.

   b. During clearance air monitoring, negative air pressure equipment shall remain in continuous operation.

2. Failure of Clearance Air Monitoring:

   a. Satisfactory clearance air sampling is achieved only when requirements of ICR 56, AHERA under 40 CFR 763 and New York State Education Department have been met.

b. Re-clean any asbestos abatement work area or other area not meeting satisfactory clearance air monitoring results criteria for any of the following:

1) ICR 56 .
2) AHERA under 40 CFR 763, using wet methods with negative air pressure equipment operating as required by ICR 56.

c. Project Monitor shall collect new samples in same locations for each asbestos abatement work area with air samples not meeting clearance air monitoring results criteria.

d. Repeat cleaning, air sampling, monitoring, and analysis until satisfactory clearance air monitoring results are achieved throughout entire asbestos abatement work area.

e. Failure of clearance air monitoring indicates that Contractor did not properly complete abatement activity:

1) Contractor shall perform all cleaning at no additional cost to Owner.

2) Contractor shall reimburse Owner for all costs associated with project monitoring, air sampling and air sample analysis during additional cleaning and clearance air sampling.

3) Contractor remains responsible for complying with all specified schedules and timing.

3.8 WORK AREA REMOVAL PROCEDURES

A. Removal of Work Area Containment:

1. Remove all remaining plastic sheeting, barriers, decontamination facilities; negative pressure equipment and ancillary items only after satisfactory clearance air monitoring results are achieved.

2. Notify Project Monitor immediately if any residual asbestos-containing debris is discovered during removal of plastic sheeting, barriers, decontamination facilities, negative pressure equipment and ancillary items, and clean up debris in accordance with ICR 56-9.3.

3. Clean all tape, glue, staples, etc. used in abatement process.

4. Repair any damage to walls, floors, ceilings, fixtures, or other items not scheduled for demolition or abatement to at least pre-abatement condition. Where finishes are damaged, refinish or repaint entire object or to nearest break in surface of walls, ceilings, soffits, etc.

5. Where partial occupancy by Owner is required, portion of asbestos abatement work will not be considered returned to Owner until entire containment is removed and Owner can use space for intended purpose or other entities can occupy space for additional work as applicable.

3.9 FIELD QUALITY CONTROL

A. Inspection of Barriers: Provide inspection of all barriers at least twice daily by Asbestos Supervisor and record inspections and observations in daily project log.

B. Repairs to Barriers and/or Enclosure Systems: Repair damage and defects in barriers and enclosure systems immediately upon discovery and prior to resumption of abatement activities.

C. Testing of Barriers and Enclosure Systems: Use smoke tubes with negative air pressure ventilation units in operation to test effectiveness of asbestos abatement work area barriers and personal and waste decontamination enclosure systems. Perform these tests prior to beginning of abatement activities and at least once daily afterwards until satisfactory clearance air monitoring results are achieved. Document test results, observations and modifications in daily project log.

D. Testing By Owner:

1. Intent: Project Monitoring and Air Sampling provided by Owner intended to:

    a. Monitor Contractor's compliance with plans, specifications and asbestos related regulatory requirements.
    b. Fulfill air-sampling requirements of ICR 56, 40 CFR 763 and New York State Education Department.

2. Where no air sampling is required by applicable regulations, Owner reserves the right, without incurring any obligation to perform air sampling for any or all stages or portions of the work.

3. Contractor Requirements:

    a. Provide access to asbestos abatement work areas for Project Monitor/Air Sampling Technician employed by Owner to observe all asbestos abatement work and collect air samples as required by ICR 56, 40 CFR 763 and New York State Education Department.

    b. Provide adequate lighting, ladders, scaffolding, and similar items to enable Project Monitor/Air Sampling Technician to perform visual inspections of all surfaces within asbestos abatement work areas.

    c. Provide sufficient temporary electrical power to locations within asbestos abatement work areas as required to supply high volume air sampling pumps for daily and clearance air samples.

d. Do not perform any air monitoring functions under ICR 56. Notify Owner and Architect immediately of any conflict of interest between Contractor and any firm providing project monitoring, air sampling or laboratory analysis.

e. Contractor retains complete and total responsibility for complying with plans, specifications and all regulatory requirements.

E. Air Sampling Procedures:

1. Flow Rate, Capacity and Chain of Custody:

a. Flow Rate: Between 2 and 10 liters per minute.

b. Calibration: Pre-calibrate and post-calibrate pumps with each use.

c. Chain of Custody: Transport all samples under chain of custody.

d. Clearance Air Sampling Equipment Placement: Place air sampling equipment within asbestos abatement work area at random around asbestos abatement work area. If asbestos abatement work area contains number of rooms equivalent to required number of samples, place sampler in each room. When number of rooms is greater than required number of samples, select representative sample of rooms. Do not place in corners of rooms or near obstructions.

2. Analysis Time:

a. PCM Clearance Air Sample Analysis: Provide overnight delivery of the samples to the laboratory. Maximum turnaround time from receipt of the samples at laboratory until receipt of faxed results is 12 hours. Ensure maximum time between sample collection and analysis of all samples is 48 hours.

b. TEM Clearance Air Sample Analysis: Provide overnight delivery of the samples to the laboratory. Maximum turnaround time from receipt of the samples at laboratory until receipt of faxed results is 24 hours. Ensure maximum time between sample collection and analysis of all samples is 48 hours.

3. Air Sample Blanks:

a. PCM Air Samples: Submit blank sample cassettes daily equal to 10 percent of the total number of samples collected that day, but not less than 2 cassette blanks per day.

b. TEM Air Samples: Submit 1 sealed blank and 2 field blanks for each set of clearance samples.

F. Air Sampling Required by New York State Education Department: In addition to clearance air sampling requirements included in ICR 56 and AHERA regulations – 40 CFR 763, provide TEM clearance air samples collected and analyzed per AHERA for all projects where clearance air samples are required by ICR 56.

G. Air Sampling Required by ICR 56:

1. Method of Analysis: At a minimum, use PCM analysis as method of analysis for ICR 56 compliance sampling. Owner reserves the right to allow TEM clearance air samples without PCM samples and where PCM analysis results in fiber counts exceeding air clearance levels, Owner reserves right to use TEM analysis to obtain more accurate asbestos fiber count.

2. Variance: Where provisions of specific variance differ from ICR 56 and provisions specified in this Section, comply with provisions of specific variance. Where provisions of a specific variance differ from AHERA regulations, the more stringent provisions shall prevail.

3. Background Air Sampling (prior to start of Project): Collect minimum 1 air sample from inside and outside of each area with minimum volume collected of 1500 liters.

4. Pre-Abatement Air Sampling (Area Preparation): Collect pre-abatement air samples on at least 1 day during work area preparation with minimum 1500 liters volume collected.

    a. Large Asbestos Abatement Projects: Collect minimum of 5 samples inside and outside of each asbestos abatement work area. Where area is greater than 25,000 square feet, collect additional representative area sample for every 5,000 square feet.

    b. Small Asbestos Projects: Collect minimum of 3 samples inside and outside of each asbestos abatement work area.

    c. Minor Asbestos Projects: Collect minimum of 1 sample inside and outside of each asbestos abatement work area.

5. During Abatement: Collect air samples daily when actual abatement activities have begun, preparation or other work prior to beginning actual abatement activities has disturbed asbestos containing materials, or preparation or other work prior to beginning actual abatement activities can reasonably be anticipated to disturb asbestos.

    a. Large Asbestos Projects: Collect samples as required by ICR 56-17.3.
    b. Quantity: Collect as close to 1500 liters as possible without exceeding flow rate of 10 liters per minute. Continue sample collection during entire workday.

6. Post Abatement (Clearance Air Monitoring):

    a. Drying Time:

        1) Do not begin sampling until period equal to or greater than that required by ICR 56-9.1 (f) final cleaning has been completed and no visible pools of liquid or condensation remain. Use aggressive sampling techniques as per ICR 56-17.

        2) Negative air pressure equipment shall remain in continuous operation during clearance air monitoring

b. Minimum Collection Volume: 1500 liters.

c. Large Asbestos Abatement Projects: Collect minimum of 5 samples inside and outside of each asbestos abatement work area. Where area is greater than 25,000 square feet, collect additional representative area sample for every 5,000 square feet.

d. Small Asbestos Projects: Collect minimum of 5 samples inside and 3 samples outside of each asbestos abatement work area.

e. Minor Asbestos Projects: Collect minimum of 5 samples inside and 1 sample outside of each asbestos abatement work area.

f. Clearance Criteria: Clearance air monitoring results considered satisfactory when every sample demonstrates airborne concentration of asbestos fibers less than 0.01 fibers per cubic centimeter or background level, whichever is greater.

g. Dirt Floor Crawlspace Clearance Monitoring Modifications

1) During ICR 56 "Abatement Phase IIC – Final Cleaning & Clearance Air Samples", in addition to the requirements of ICR 56 Subpart 56-4.9(c), air monitoring within the work area shall be conducted daily for the entire workshift. The number of required inside work area air samples shall be consistent with the size of the work area (i.e. 1-minor, 3-small, 5-large, including required additional samples for work areas over 25,000 sf). The inside sample locations shall be distributed throughout the work area.

2) In lieu of post-abatement clearance air monitoring in compliance with ICR-56-9.2(d), the most recent daily abatement air samples collected during cleaning operations in the regulated work area, shall be used for comparison with ICR 56-4.11 clearance criteria. For large abatement work areas (≥ 160 square feet or ≥ 260 linear feet of abatement) TEM air samples shall be collected and analyzed for the daily / clearance air samples used for comparison to clearance criteria.

H. Clearance Air Sampling Required by AHERA Regulations 40 CFR 763:

1. Clearance air sampling requirements for compliance with AHERA regulations provided in addition to ICR 56 requirements.

a. For all clearance air sampling for compliance with the AHERA Regulations, 40 CFR 763, 5 samples shall be collected within each regulated abatement work area.

b. Where PCM air samples are allowed by AHERA, collect and analyze additional PCM samples to supplement samples collected for compliance with ICR 56 for a minimum of 5 samples collected within the regulated abatement work area.

c. Where TEM air samples are required by AHERA, collect and analyze TEM air samples required by AHERA in lieu of PCM air samples required by ICR 56. Collect a minimum of 5 samples within each regulated abatement work area.

2. Required Analysis:

a. Type of Analysis: Provide TEM analysis when more than 160 square feet or 260 linear feet of asbestos containing material are removed within containment barriers used to isolate functional space. Do not separate contiguous portions of material subject to abatement conducted concurrently or at approximately same time within same building to qualify for PCM analysis.

b. TEM Sampling:

1) Sample Volumes - Collect sample volumes as follows:

a) 25 mm Cassettes: Between 1,199 and 1,800 liters of air.
b) 37 mm Cassettes: Between 2,799 and 4,000 liters of air.

2) Sample Number - Collect and submit following samples:

a) Within Containment Barriers: 5 samples.
b) Outside Containment Barriers: 5 samples.
c) Submit 1 sealed blank and 2 field blanks.

3) Clearance Criteria:

a) Results considered satisfactory and asbestos abatement activity considered complete when average of 5 samples collected inside containment barriers does not exceed 70 structures per square millimeter.

b) If average of 5 samples collected inside containment barriers exceeds 70 structures per square millimeter, Owner may elect to compare results of 5 samples collected inside containment barriers to remaining samples. If concentration of asbestos on 5 samples collected within barriers is not statistically different from concentration of asbestos of 5 samples collected outside of containment barriers when analyzed and compared as per Appendix A of Subpart E of 40 CFR 763, clearance air monitoring results considered satisfactory and asbestos abatement activity considered to be complete.

c. PCM Sample Analysis:

1) Sample Volume: Collect minimum of 1500 liters of air.

2) Sample Number: Collect 5 samples within containment barriers.

3) Clearance Criteria: Results considered satisfactory and asbestos abatement activity considered complete when each of 5 samples collected inside containment barriers is less than 0.01 fibers per square centimeter.

3.10 CLEANING

A. Daily Cleaning of Enclosures: HEPA vacuum and/or wet clean personal and waste decontamination enclosure systems at end of each day of abatement activities.

3.11 ASBESTOS WASTE DISPOSAL PROCEDURES

A. All waste generated as part of the asbestos project shall be removed from the site within 10 days after successful completion of satisfactory clearance air sampling and dismantling of all regulated abatement work areas at the site.

B. Regulated Asbestos Containing Material (RACM): Category I non-friable asbestos-containing material that does not become friable is not considered to be RACM. All other waste materials removed as part of asbestos abatement work, including (but not limited to) friable asbestos-containing material, Category II non-friable asbestos-containing materials, plastic sheeting, disposable clothing and filters from control devices are considered to be RACM.

1. Adequately wet and properly containerize or seal in leak-tight wrapping all RACM.

2. Label all containers or wrapped material in accordance with requirements of OSHA in 29 CFR 1926.1101 (j) (2) with labels printed in letters of sufficient size and contrast to be readily visible and legible. Include following information on labels:

    a. Name of waste generator.
    b. Location where waste was generated.
    c. Name of abatement contractor.

3. Provide written notification a minimum of 5 days prior to transport of waste to each disposal site utilized. Notification shall include a draft manifest indicating which disposal site and transporter will be used, and which type of waste is included in the shipment. Purpose of notification is to verify if landfill and transporter are permitted and match the submitted items.

4. Deposit all RACM as soon as practical at waste disposal site operated in accordance with 40 CFR Part 61.154 and 6 NYCRR 364.

5. Line all vehicles used to transport RACM off site with two layers of plastic sheeting sealed leak-tight.

6. When RACM is transported off site (regardless of amount), transport using vehicles with valid Industrial Waste Hauler Permit for asbestos containing material as per 6 NYCRR 364.

7. Identify vehicles used to transport RACM during loading, during entire time vehicle is on site, and during unloading as per 40 CFR 61.149.

8. Maintain waste shipment records as per 40 CFR 61.150, and provide copy of waste shipment records to disposal site owners or operators when RACM is delivered to disposal site. Return copy of waste shipment record, signed by owner or operator of designated disposal site, to Owner within 35 days of date waste was accepted by initial transporter.

C. All Other Waste: Category I non-friable material may be transported and disposed of as Construction and Demolition debris in accordance with 6 NYCRR 360 and 364. Contractor is responsible for maintaining Category I non-friable material in non-friable condition if intended to be disposed of as construction and demolition debris. Provide trip tickets or other documentation clearly identifying amount of material removed from site, transported to disposal site and disposed of including at least:

1. Name, address and telephone of waste generator.
2. Approximate quantity.
3. Name and telephone number of disposal site operator.
4. Name and physical site location of disposal site.
5. Name, address and telephone number of transporter.

D. Contractor is responsible to confirm if flow control measures (if in effect in the county of operation) permits use of the proposed landfill.

END OF SECTION 02 82 00

Appendix A

Pre-Renovation Environmental Survey Reports

Waverly Central School District

Waverly, NY

Elm Street Elementary School - Phase 2
Pre-Renovation Environmental Survey

June 2026

TETRA TECH
10 Brown Rd | Ithaca, NY 14850

INTRODUCTION

Tetra Tech Architects & Engineers (TAE) was retained by the Waverly Central School District (District) to perform a pre-renovation survey for accessible asbestos, lead, PCBs, and RCRA metal containing materials related to renovation work for a renovation project at Elm Street Elementary School designed by TAE project number 339070-25002. The renovation scope primarily focused on kitchen and front office space renovations

The identified scope of work was to conduct an asbestos pre-renovation survey in accordance with NYS Code Rule 56, and 40 CFR 763 (AHERA) in selected areas of the below identified buildings, limited to areas impacted by the planned scope of renovations. The survey is intended to supplement the district's existing sampling data. Additionally, the survey included testing of caulking materials impacted by the planned renovation scope for PCBs and RCRA metals.

The scope of the survey includes the below buildings, or portions thereof:

- Elm Street Elementary School – 145 Elm street, Waverly , NY 14892

1. EXECUTIVE SUMMARY

Survey work including a visual inspection and sample collection were performed by Timothy J Thomas (New York State DOL Certificate # 06-17988 / 26-6S5L7-SHAB) on the following dates: January 28th, 2026 and March 11, 2026. The samples were submitted for analysis to Paradigm Environmental Services, under chain of custody protocol. Copies of applicable certifications and licenses are attached in Appendix F.

A pre-renovation survey was conducted at the Elm Street Elementary School for the work associated with Phase 2 of the renovation project. Prior to this survey, several hazardous building materials were previously identified. Upon completion the site inspection and subsequent bulk sampling , it was determined that the carpet tile mastic in the library is asbestos containing. It is believed that this is residual asbestos mastic from a previous flooring system, and not directly associated with the mastic with the relatively newer carpet mastic.

Additionally, caulking around the Receiving door frame was determined to contain asbestos and lead. This was the observed extent of this caulking and it was not observed anywhere else throughout the limits of the renovation scope. A different white caulking material located around the infilled window at the central entrance was found to be non-hazardous.

In the main office and nurse suite areas, asbestos containing ceiling plaster, located above the suspended ceiling tile system, was previously identified as asbestos containing. Similarly, the ceiling plaster in the girls locker room is asbestos containing. A textured wall plaster is also present throughout the gym, however this material is not anticipated to be disturbed in the Phase 2 renovations.

Also previously identified, door/window frame caulking at the 1939 building addition is lead containing.

2. SURVEY METHODOLOGY

a. Review of Existing Records

Prior to conducting on-site visual inspections, all existing testing records and AHERA management plans provided were reviewed and, where possible, incorporated into the survey. Where previous sampling was determined to be inadequate or insufficient due to changes in sampling or analysis protocol since the time of the original sampling, said materials were re-sampled so as to comply with the current regulations. The following existing reports were provided for review:

- 1988 Friend Lab AHERA Report
- 2010-2012 – Various O'Rourke Sampling Reports
- 2023 Tetra Tech – Elm St / Bus Garage Pre-Renovation Environmental Survey
- 2025 Tetra Tech – Pre-Renovation Environmental Survey

b. Asbestos Survey Method

This survey is intended to provide the necessary information and documentation required by NYSDOL Code Rule 56 – 12 NYCRR 56, and USEPA's AHERA regulation - 40 CRF 763, Subpart E to prepare abatement design documents for the above referenced project. In accordance with the above regulations, samples were collected and analyzed for the presence of asbestos.

The only acceptable method in demonstrating that a suspect material is not an asbestos containing material (ACM) is via bulk sampling. In order to properly demonstrate that each homogeneous material is not ACM, a minimum number of samples must be analyzed and shown to contain 1% or less asbestos by weight. Surfacing materials must demonstrate a minimum of 3, 5, or 7 samples, depending on the amount of each homogeneous surfacing material present. Thermal System Insulation homogeneous materials must demonstrate a minimum of 3 samples at or below 1% asbestos content. All other miscellaneous materials are required to demonstrate a minimum of 2 samples per homogeneous material.

Homogeneous materials are identified during the course of the survey and multiple factors are considered when identifying homogeneous materials, such as color, texture, installation date, and intended use. As such it is not uncommon to find multiple similar homogeneous materials in a single facility.

Where new homogeneous materials were identified, or insufficient existing data existed for previously identified homogeneous materials, additional bulk samples were collected for laboratory analysis. Refer to the Sample Result Summaries and Asbestos Material Summaries in Appendices A and B respectively for the homogeneous materials tested and identified in each facility.

c. Laboratory Analysis

All samples collected were submitted to a lab that meets the requirements of the above regulations. The laboratory determines the appropriate method of analysis for each sample based on the composition of the material itself. Some types of materials are subject to sample preparation prior to analysis, or multiple types of analysis.

Friable samples, are analyzed by NYS ELAP method 198.1, where non-friable organically bound (NOB) materials are prepped and analyzed by NYS ELAP methods 198.6 and 198.4 where necessary. NOB materials are materials whose constituent components are 'bound' together in a vinyl or asphaltic matrix. Examples of NOB materials include but are not limited to floor tiles, mastics, caulking and roofing materials. Prior to stereoscopic analysis, the NOB materials are prepared in an ashing process and in an acid bath to break down the binder materials to allow for easier visual identification of asbestos fibers.

Copies of all laboratory analysis are included in Appendix E.

d. Result Interpretation

The above regulations require that any material found to contain greater than 1% asbestos by weight is considered ACM. Where multiple samples of the same homogeneous material are analyzed and only some of the samples are greater than 1%, the material is considered ACM.

Samples analyzed to contain greater than 1% asbestos and which are considered ACM are in bold in the Sample Result Summaries in Appendix B, and their assessment and extent is detailed in the Asbestos Material Summaries in Appendix C.

e. Materials Containing <1% Asbestos

Materials which have been analyzed and found to contain between 0% -1% asbestos are not considered ACM by federal and state regulations, and as such, most federal and state regulations do not apply. However OSHA's Construction Standard for Asbestos – 29 CRF 1926.1101 does regulate materials with any content of asbestos. The standard includes applicable requirements for exposure monitoring of employees for such low level asbestos materials.

f. PCBs

PCBs were manufactured and processed between 1929 and 1977. The USEPA issued a ban and phase-out rule for PCBs in 1979, as such, testing of caulking materials within the project scope is limited to materials installed prior to 1979.

Caulking (or other materials) identified with concentrations of 50 parts per million (PPM) or greater are regulated as PCBs Bulk Product Waste by federal and state regulations.

g. RCRA Metals

USEPA and NYSDEC regulate the disposal or materials containing heavy metals. USEPA's Resource Conservation and Recovery Act (RCRA) sets limits for each of the 8 metals defined. Bulk samples of the materials represent Total amount of contaminant in each material, where disposal requirements are based upon a cross section of the entire wastestream and its leachable properties. The process for the testing method of these materials effectively dilutes the results by a factor of 20, as such total analysis results are permitted to be 20 times as high as the regulatory level; this is known as the Rule of Twenty.

Contaminant	***Regulatory Level (mg/L)***	***Rule of 20 Level (mg/L)***
Arsenic	5	100
Barium	100	2000
Cadmium	1	20
Chromium	5	100
Lead	5	100
Mercury	.2	4
Selenium	1	20
Silver	5	100

3. REPORTING REQUIREMENTS

New York State Department of Labor's Code Rule 56 require that an asbestos survey be performed for each renovation project. Subsequent projects may utilize the data contained within this and previous surveys, but at a minimum a survey must be performed reviewing the scope of work and the existing data to determine if additional sampling is necessary.

The following distribution requirements are required by regulation:

1. A copy of this survey report must be kept on each renovation project site for the duration of the project and must be available to all parties who inquire. Any notifications or variances must be similarly available.
2. A copy of this survey report must be incorporated into the District's asbestos management plan. These plans should be kept at each facility as well as in the district's administrative/record office.
3. A copy of this report is required to be submitted to the local government entity responsible for issuing a permit.
4. For projects where demolition of the building, or portion thereof, is scheduled, a copy of this report must be submitted to the NYSDOL's Asbestos Control Bureau.

4. LIMITATIONS

The survey was conducted with the following limitations and assumptions:

1. This report is limited to the above referenced project. Asbestos location drawings included are limited to indicate the locations and extent of identified asbestos containing materials impacted by the current scope of survey or renovation. Additional ACM may be present beyond the scope of work, or below grade.
2. Except where documented otherwise, the survey was limited to accessible materials and did not include destructive testing to locate or identify potentially suspect materials that may be concealed behind existing construction.
3. Areas that were inaccessible at the times of inspection may contain additional ACM.
4. Identified amounts and locations of asbestos containing materials are intended to be estimates and should be verified by the asbestos project designer prior to soliciting proposals, and by the abatement contractor prior to submission of bid.
5. This report is not intended to be used as an asbestos design document. A certified project designer is required to review this report and supplement it with additional sampling or inspections determined necessary to adequately determine the extent of abatement necessary.

5. APPENDICIES

Appendix A – Historical Sampling Summaries
Appendix B – Sample Result Summaries

Appendix C – Asbestos Materials Summaries
Appendix D – Sample Location Plans & Asbestos Location Plans
Appendix E – Laboratory Analysis & Chains of Custody
Appendix F – Certifications
Appendix G – Reference Photos

APPENDIX A

Historical Sampling Summaries

Historical Sampling Summary - Elm St Elementary School

material	vintage	# samples	Source	comment
Roofing				
Fiberboard (top Layer)	Renov	4	TTAE 2024	
Fiberboard (Bottom Layer)	Renov	2	TTAE 2024	
Asphalt Roof Tar	1939	2	TTAE 2024	
Concrete Deck	1939	2	TTAE 2024	
Old Fiberboard Residual (bottom)	Renov	2	TTAE 2024	
Built Up Roofing	**1928**	**2**	**TTAE 2024**	
Concrete Deck	1928	2	TTAE 2024	
TSI/Mech				
Tar Paper Pipe Wrap	1939	1	TTAE 2023	
Aircell Pipe Insulation	**1939**	**1**	**TTAE 2023**	
Ceilings				
Ceiling Plaster - Skim Coat		2	O'Rourke 2013	
~~Ceiling Plaster~~		~~2~~	~~O'Rourke 2010~~	
2x4 Ceiling Tile - Tegular Divided	Renov	2	TTAE 2023	
2x2 Ceiling Tile - Tegular	Renov	2	TTAE 2023	
2x2 Ceiling Tile - Old Fissure & Dot	**Renov**	**2**	**TTAE 2023**	
2x4 Ceiling Tile - Old Fissure & Dot	Renov	2	TTAE 2023	
2x2 Ceiling Tile - Newer Fissure & Dot	Renov	2	TTAE 2024	
2x2 Ceiling Tile - Tegular Accoustic	Renov	2	TTAE 2023	
1x1 Ceiling Tile - Accoustic	1939	3	TTAE 2023	
Ceiling Tile Mastic - Brown	1939	3	TTAE 2023	
2x4 Ceiling Tile - Tectum Patterned	Renov	2	TTAE 2023	
2x4 Ceiling Tile - Vinyl Faced	Renov	2	TTAE 2023	
Ceiling Plaster - Finish Coat	1928	3	TTAE 2023	
Ceiling Plaster - Base Coat	1928	3	TTAE 2023	
Ceiling Plaster - Finish Coat	1939	1	TTAE 2023	same as 1939 wall plaster (non textured)
Ceiling Plaster - Base Coat	1939	4	TTAE 2023	same as 1939 wall plaster (non textured)
Textured Ceiling Plaster - Finish Coat	**1939**	**3**	**TTAE 2023**	
2x2 Ceiling Tile - Tegular pin/Dot	2025	2	TTAE 2026	
Wall Surfacing				
~~Plaster~~		~~6~~	~~O'Rourke 2010~~	
Wall Plaster - Skim Coat		2	O'Rourke 2013	
Wall Plaster - Base Coat		1	O'Rourke 2013	
Sheetrock - Grey	Renov	2	TTAE 2023	
Sheetrock Skim Coat - Finish	Renov	3	TTAE 2023	
Sheetrock Skim Coat - Base	Renov	3	TTAE 2023	
Sheetrock - Tan	Renov	1	TTAE 2023	
Joint Compound	Renov	1	TTAE 2023	
Wall Plaster - Finish Coat	1939	4	TTAE 2023	same as 1939 Ceiling plaster (non textured)
Wall Plaster - Base Coat	1939	4	TTAE 2023	same as 1939 Ceiling plaster (non textured)
Wall Plaster - Finish Coat	1928	3	TTAE 2023	
Wall Plaster - Base Coat	1928	3	TTAE 2023	
Textured Wall Plaster (Gym)	**1939**	**3**	**TTAE 2023**	
Tar Vapor Barrier on wall	1939	2	TTAE 2023	
CMU Wall Paint	1928	2	TTAE 2023	
CMU Wall Paint	1939	2	TTAE 2023	
Pyro/Ebasry Block		2	ATL 2025	
Pyro/Ebasry Block Mortar		2	ATL 2025	
Ceramic Wall Tile Grout	Renov	2	TTAE 2026	
Ceramic Wall Tile Mudset	Renov	2	TTAE 2026	

White Ceramic Wall Tile/Base Grout	Renov	2	TTAE 2026
White Ceramic Wall Tile/Base Mortar	Renov	2	TTAE 2026

Flooring

Floor Tile - Black		**4**	**O'Rourke 2011**
Floor Tile - Brown		**2**	**O'Rourke 2011**
Floor Tile - Green		2	**O'Rourke 2011**
Quarry Tile Morar/Grout	1939	3	TTAE 2026
Mosaic Ceramic Floor Tile Grout	1939	2	TTAE 2026
Mosaic Ceramic Floor Tile Mudset	1939	2	TTAE 2026
12x12 Floor Tile - Tan Mottled	Renov	2	TTAE 2026
Floor Tile Mastic - Yellow (w/ grey leveler)	Renov	2	TTAE 2026
12x12 Floor Tile - White Mottled	2008	1	TTAE 2026
12x12 Floor Tile - Red Mottled	2008	1	TTAE 2026
Carpet Tile/Floor Tile Mastic - Dk Grey	2008	2	TTAE 2026
Infilled Concrete Subfloor	2008	2	TTAE 2026
Carpet Tile Mastic - Bluegreen	Renov	2	TTAE 2026
Carpet Tile Mastic - Clear w/ residual black	**Renov**	**2**	**TTAE 2026**
Hardwood Floor Paper Vapor Barrier	1939	2	TTAE 2026
Concrete Subfloor/Topping	1939	2	TTAE 2026

Misc

Sink Undercoating - Lt Grey	Renov	2	TTAE 2026

Caulking

Window Frame/Sill Caulk - Black	Renov	2	TTAE 2023
Louver Caulk - Brown	1928 Renov	2	TTAE 2024
Casework Top Caulk - Beige	Renov	2	TTAE 2024
Overhead Door Frame Caulk - Old/Cracked White	**1939**	**2**	**TTAE 2026**
Interior Door Glazing Compound - Black	Renov	2	TTAE 2026
Window Infill Cualk - Hard White	Renov	2	TTAE 2026
Window Infill Caulk - Soft Brown	Renov	2	TTAE 2026

PCBs/Metals

Window Frame/Sill Caulk - Black	**Renov**	**1**	**TTAE 2023**	**Lead**
Louver Caulk - Brown	1928 Renov	1	TTAE 2024	
Overhead Door Frame Caulk - Old/Cracked White	**1939**	**1**	**TTAE 2026**	**Lead**
Window Infill Caulk - Hard White/ Soft Brown	Renov	1	TTAE 2026	

Legend

Bold - Item identified to contain asbestos/PCBs/RCRA metal

~~Struck Items~~ - Items where previous sampling does not meet the current analysis standards and is considered void

APPENDIX B

Sample Result Summaries

Sample Result Summary Table 1.1 – Asbestos

Sample ID #	Material	Location	Vintage	Result
12826E- 1	**Overhead Door Frame Caulk - Old/Cracked White**	**Receving**	**1939**	**7.10%**
12826E- 2	**Overhead Door Frame Caulk - Old/Cracked White**	**Receving**	**1939**	**1.90%**
12826E- 3	Interior Door Glazing Compound - Black	Receving	Renov	NAD
12826E- 4	Interior Door Glazing Compound - Black	Clrm 122	Renov	NAD
12826E- 5	2x2 Ceiling Tile - Tegular Pin/Dot	Clrm 121	2025	NAD
12826E- 6	2x2 Ceiling Tile - Tegular Pin/Dot	Library Storage	2025	NAD
12826E- 7	Sink Undercoating - Lt Grey	Clrm 121	Renov	NAD
12826E- 8	Sink Undercoating - Lt Grey	Clrm 121	Renov	NAD
12826E- 9	Ceramic Wall Tile Grout	Dishwashing	Renov	NAD
12826E- 10	Ceramic Wall Tile Mudset	Dishwashing	Renov	NAD
12826E- 11	Ceramic Wall Tile Grout	Dishwashing	Renov	NAD
12826E- 12	Ceramic Wall Tile Mudset	Dishwashing	Renov	NAD
12826E- 13	Quarry Tile Moartar/Grout	Cafeteria	1939	NAD
12826E- 14	Quarry Tile Moartar/Grout	Cafeteria	1939	NAD
12826E- 15	Quarry Tile Moartar/Grout	Girls Locker Room	1939	NAD
12826E- 16	White Ceramic Wall Tile /Base Grout	Girls Locker Room	1939	NAD
12826E- 17	White Ceramic Wall Tile /Base Grout	Girls Locker Room	1939	NAD
12826E- 18	White Ceramic Wall Tile /Base Mortar	Girls Locker Room	1939	NAD
12826E- 19	White Ceramic Wall Tile /Base Mortar	Girls Locker Room	1939	NAD
12826E- 20	Mosaic Ceramic Floor Tile Grout	Girls Locker Room	1939	NAD
12826E- 21	Mosaic Ceramic Floor Tile Grout	Girls Locker Room	1939	NAD
12826E- 22	Mosaic Ceramic Floor Tile Mudset	Girls Locker Room	1939	NAD
12826E- 23	Mosaic Ceramic Floor Tile Mudset	Girls Locker Room	1939	NAD
31126- 1	Window Infill Caulk - hard white	Middle Entryway	Renov	NAD
31126- 2	Window Infill Caulk - hard white	Middle Entryway	Renov	NAD
31126- 3	Window Infill Caulk - Soft Brown	Middle Entryway	Renov	NAD
31126- 4	Window Infill Caulk - Soft Brown	Middle Entryway	Renov	NAD
31126- 5	12x12 Floor Tile - Tan Mottled	Clrm 122	Renov	NAD
31126- 6	Floor Tile Mastic - Yellow & Floor Leveler (Grey)	Clrm 123	Renov	NAD
31126- 7	Floor Tile Mastic - Yellow & Floor Leveler (Grey)	Clrm 124	Renov	NAD
31126- 8	12x12 Floor Tile - Tan Mottled	114B	Renov	NAD
31126- 9	Hardwood Floor Paper Vapor Barrier	114B	1939	NAD
31126- 10	Hardwood Floor Paper Vapor Barrier	114B	1939	NAD
31126- 11	Concrete Subfloor/topping	114B	1939	NAD
31126- 12	Concrete Subfloor/topping	114B	1939	NAD
31126- 13	Carpet Tile Mastic - Dark Grey	Main Office	2008	NAD
31126- 14	Carpet Tile Mastic - Dark Grey	Main Office	2008	NAD
31126- 15	Infilled Concrete Subfloor	Main Office	2008	NAD
31126- 16	Infilled Concrete Subfloor	Main Office	2008	NAD
31126- 17	12x12 Floor Tile - White Mottled	Main Office	2008	NAD
31126- 18	12x12 Floor Tile - Red Mottled	Main Office	2008	NAD
31126- 19	Carpet Tile Mastic - Bluegreen	Principle	Renov	NAD
31126- 20	Carpet Tile Mastic - Bluegreen	Principle	Renov	NAD
31126- 21	**Carpet Tile Mastic - Clear w/ residual black**	**Library**	**Renov**	**5.60%**
31126- 22	*Carpet Tile Mastic - Clear w/ residual black*	*Library*	*Renov*	*<1%*

NAD = No Asbestos Detected ***NA/PS** = Not Analyzed / Positive Stop* ***>1%** = % Asbestos Containing*

% Ver = Vermiculite content *Trace / <1% Asbestos = Material not considered ACM*

Sample Result Summary Table 1.2 – PCBs & RCRA Metals

Sample ID #	Material	Analytical Results			Rule of Twenty Level	Vintage
12826E-1	Overhead Door Frame Caulk - Old/Cracked White	Arsenic	29.2	mg/k	100 mg/L	1939
		Barium	777	mg/k	2000 mg/L	
		Cadmium	8.57	mg/k	20 mg/L	
		Chromium	31	mg/k	100 mg/L	
		Mercury	0.03	mg/k	4 mg/L	
		Lead	**32000**	**mg/k**	**100mg/L**	
		Selenium	<0.971	mg/k	20 mg/L	
		Silver	<0.485	mg/k	100 mg/L	
		PCBs	<3.65	PPM	50 ppm	
31126-1	Window Infill caulk - Hard White/Soft Brown	Arsenic	<0.481	mg/k	100 mg/L	Renov
		Barium	<4.81	mg/k	2000 mg/L	
		Cadmium	<0.240	mg/k	20 mg/L	
		Chromium	0.808	mg/k	100 mg/L	
		Mercury	<0.00718	mg/k	4 mg/L	
		Lead	4.28	mg/k	100 mg/L	
		Selenium	<0.962	mg/k	20 mg/L	
		Silver	<0.480	mg/k	100 mg/L	
		PCBs	<2.23	PPM	50 ppm	

APPENDIX C

Asbestos Location Summaries

Identified Asbestos Location Summary Table 2.1 – Elm Street Elementary School

Material	Location(s)	Estimated Quantity	Friability	Condition
Overhead Door Frame Caulk - Old/Cracked White	Receiving	~1 s.f.	Non-Friable	Good
Carpet Tile Mastic - Clear w/ residual black	Library	1,180 s.f.	Non-Friable	Good
2X2 Ceiling Tile - Old Fissure and Dot (older renovation)	224, 225,137,138 Bathrooms and 203.2, 130.1 Janitors	1,090 s.f.	Friable	Good
Textured Ceiling Plaster - Finish Coat [1]	Limited areas of the 1939 building - much was abated in PH1	3,850 s.f.	Friable	Localized Damage
Textured Wall Plaster	Gym	7,200 s.f.	Friable	Good
Marble Panel Mastic (Assumed)	Front Vestibule	~90 s.f.	Non-Friable	Good

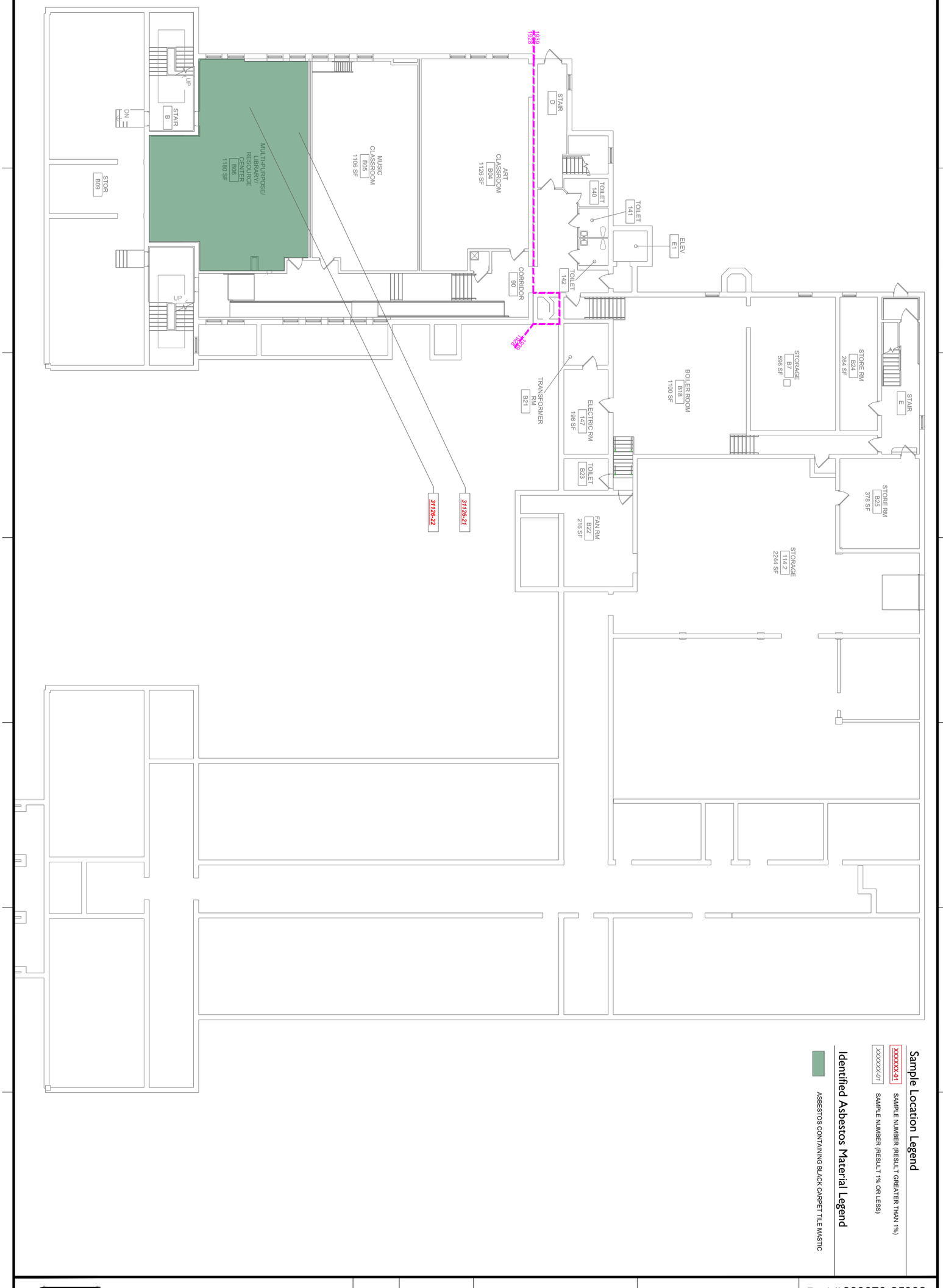
Note – Friability listed represents the current/installed state of the material. All non-friable materials have a potential to be rendered friable depending on the work methods selected to modify them.
1 - Debris associated with textured ceiling plaster has been identified on top of non-ACM suspended ceiling tile Systems as part of the Phase 1 survey. Most of those areas have been abated, however in areas where textured plaster remains above ceiling, it is assumed that debris exists above ceiling in these non-abated areas still.

Identified PCBs & RCRA Caulk Location Summary Table 2.2 –Elm Street Elementary School

Material	Location(s)	Estimated Quantity	Friability	Condition
OverHead Door Frame Caulk - Old/Cracked White [Lead]	Receiving	~1 s.f.	Non-Friable	Good
Window Frame/Sill Caulk - Black [Lead]	First and Second Floor Windows	~88 s.f.	Non-Friable	Good

APPENDIX D

Sample Location Plans &
Asbestos Location Plans



TETRA TECH
ARCHITECTS & ENGINEERS

Tetra Tech Engineers, Architects & Landscape Architects, P.C.

Rev.:	Date:	Description:

Waverly Central School District

Elm Street Elementary School

Basemenrt Floor Plan

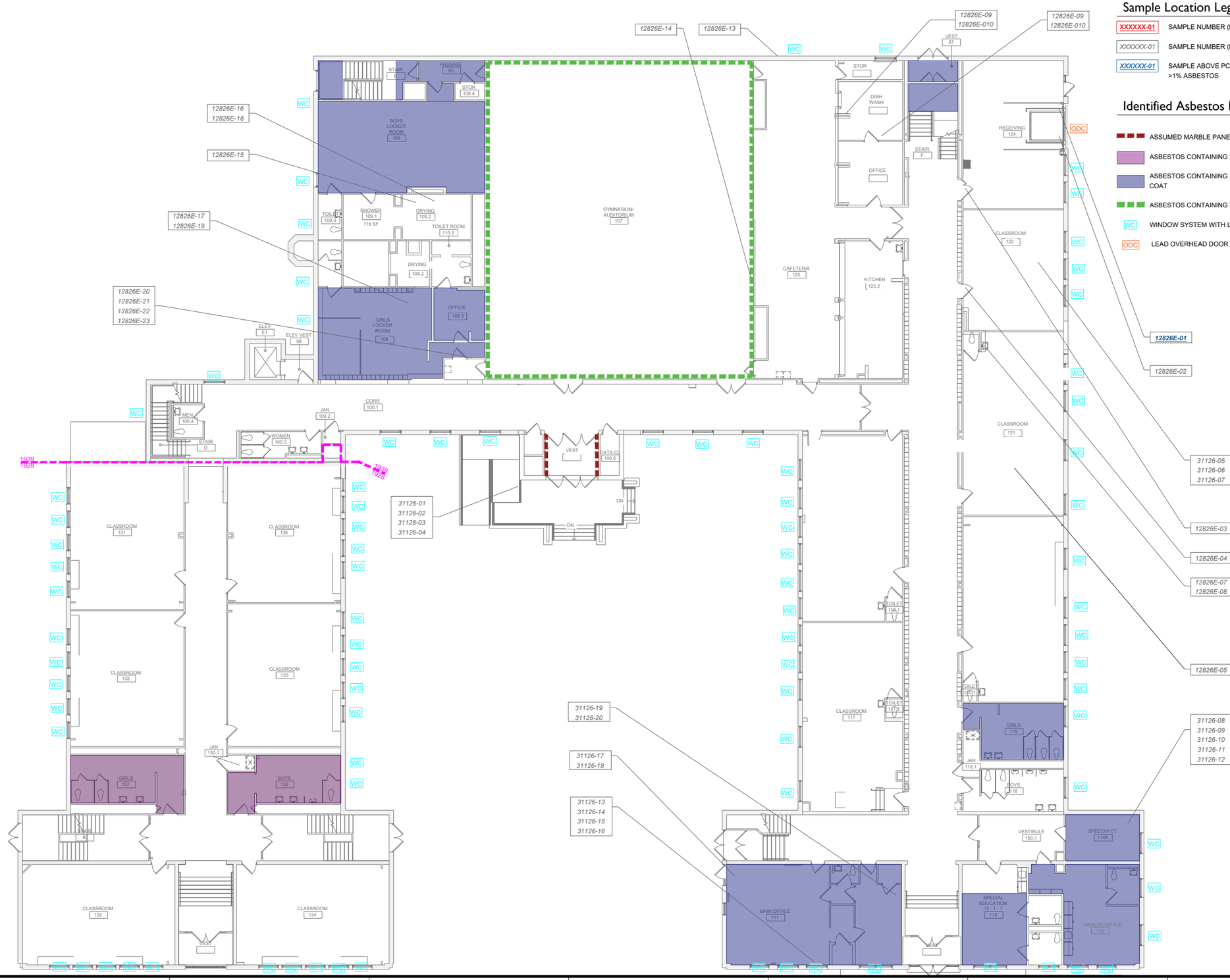
Proj # 339070-25002

Date: 6/9/26

Drawn By: MDS

Drawing No.:

ES-1



Sample Location Legend

- XXXXXX-01 — SAMPLE NUMBER (RESULT GREATER THAN 1%)
- XXXXXX-01 — SAMPLE NUMBER (RESULT 1% OR LESS)
- XXXXXX-01 — SAMPLE ABOVE PCBS/RCRA METAL LIMITS AND >1% ASBESTOS

Identified Asbestos Material Legend

- ASSUMED MARBLE PANEL MASTIC
- ASBESTOS CONTAINING 2X2CEILING TILE OLD - FISSURE AND DOT
- ASBESTOS CONTAINING TEXTURED CEILING PLASTER FINISH COAT
- ASBESTOS CONTAINING TEXTURED WALL PLASTER
- WC — WINDOW SYSTEM WITH LEAD CONTAINING FRAME CAULK
- ODC — LEAD OVERHEAD DOOR FRAME CAULKING

Proj # 339070-25002

Date: 6/8/26

Drawn By: MDS

Drawing No.: ES-2

Description:

Rev.:

Date:

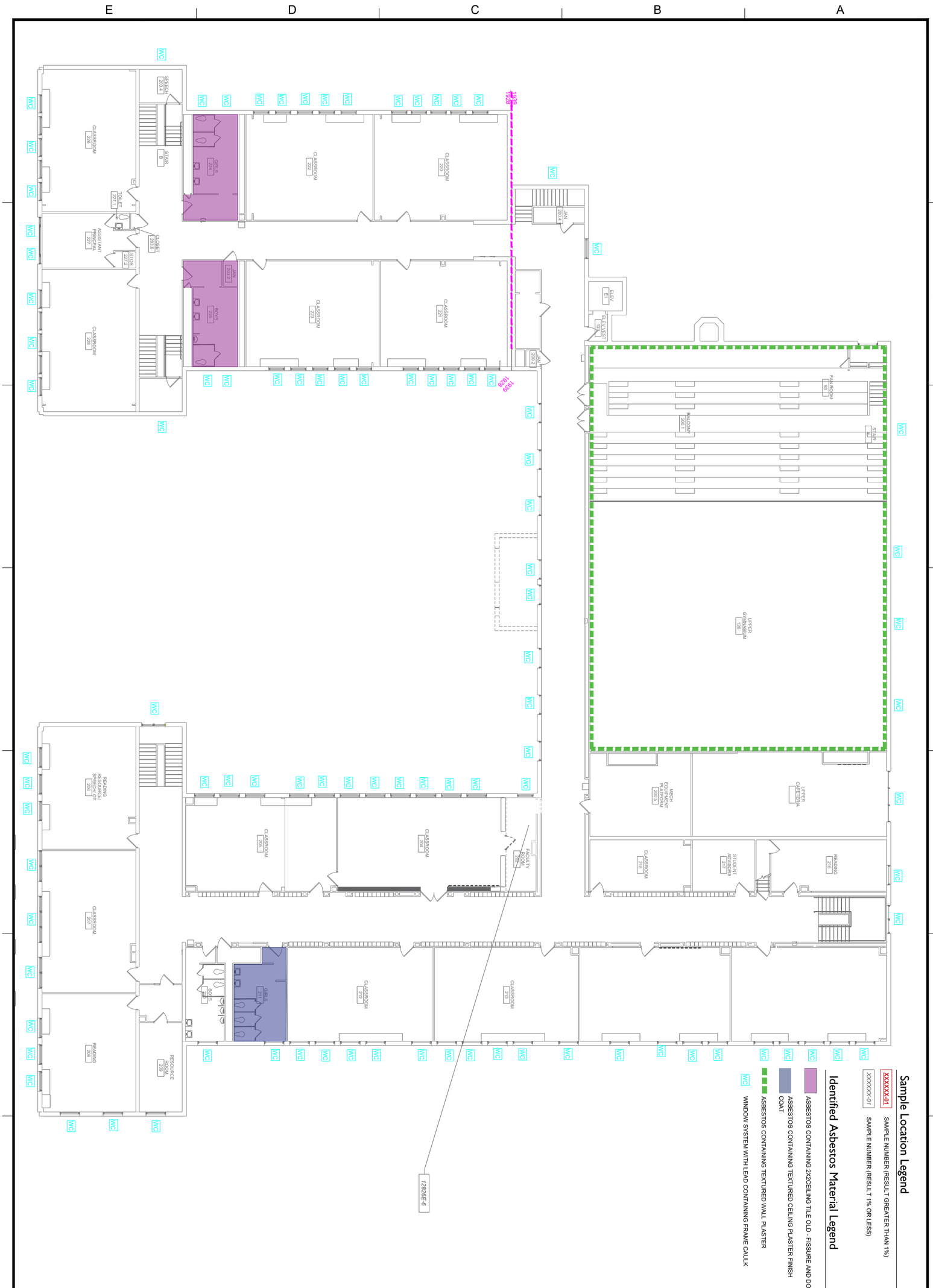
TETRA TECH
ARCHITECTS & ENGINEERS

Tetra Tech Engineers, Architects & Landscape Architects, P.C.

Waverly Central School District

Elm Street Elementary School

First Floor Plan



TETRA TECH
ARCHITECTS & ENGINEERS

Tetra Tech Engineers, Architects & Landscape Architects, P.C.

Rev.:	Date:	Description:

Waverly Central School District

Elm Street Elementary School

Second Floor Plan

Proj # 339070-25002

Date: 6/8/26

Drawn By: MDS

Drawing No.:

ES-3

APPENDIX E

Laboratory Results &
Chains of Custody

PARADIGM
ENVIRONMENTAL SERVICES

179 Lake Avenue, Rochester, NY 14608 Office: (585) 647-2530

PLM & TEM BULK ASBESTOS ANALYSIS REPORT
via NYSDOH ELAP Method 198.1,198.4 and 198.6

Client: Tetra Tech Architects & Engineers
Location: Waverly Central School Distric, Elm Street PH2
Elm Street Elementary School, 338070-25002
Sample Date: 1/28/2026

Job No: 0487-26

Client ID	Lab ID	Sampling Location	Description	PLM Asbestos Fibers Type & Percentage	PLM Total Asbestos	NOB	TEM Asbestos Fibers Type & Percentage	TEM Total Asbestos	PLM Non-Asbestos Fibers Type & Percentage	Non-Fibrous Matrix Material %
12826E-01	4900	Receiving Overhead Door	White Old/Cracked Door Frame Caulk	Inconclusive No Asbestos Detected	0%	V	Actinolite/ Tremolite 7.1%	7.1%	None Detected	92.9%
12826E-02	4901	Receiving Overhead Door	White Old/Cracked Door Frame Caulk	Inconclusive No Asbestos Detected	0%	V	Chrysotile 1.9%	1.9%	None Detected	98.1%
12826E-03	4902	Receiving Interior Door	Black Door Glazing Compound	Inconclusive No Asbestos Detected	0%	V	None Detected	ND	None Detected	100%
12826E-04	4903	Classroom 122 Interior Door	Black Door Glazing Compound	Inconclusive No Asbestos Detected	0%	V	None Detected	ND	None Detected	100%
12826E-05	4904	Classroom 121	Black Fibrous 2'x2' Tegular Pinned/Dotted Ceiling Tile	Inconclusive No Asbestos Detected	0%	#	None Detected	ND	Mineral Wool 10%	90%
12826E-06	4905	Library Storage	Gray Fibrous 2'x2' Tegular Pinned/Dotted Ceiling Tile	Inconclusive No Asbestos Detected	0%	#	None Detected	ND	Mineral Wool 10%	90%
12826E-07	4906	Classroom 121	Light Gray Sink Undercoating	Inconclusive No Asbestos Detected	0%	V	None Detected	ND	None Detected	100%
12826E-08	4907	Classroom 121	Light Gray Sink Undercoating	Inconclusive No Asbestos Detected	0%	V	None Detected	ND	None Detected	100%
12826E-09	4908	Dishwashing	Gray Ceramic Wall Tile Grout	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-10	4909	Dishwashing	Gray Ceramic Wall Tile Mudset	None Detected	0%		Not Required	N/A	None Detected	100%

KEY
No Symbol in the NOB column denotes sample analyzed by ELAP Method 198.1 (PLM).
V NOB (non-friable organically bound) denotes material analyzed by ELAP Method 198.6 (PLM) and 198.4 (TEM) as noted.
Ŷ denotes material analyzed by ELAP Method 198.6 (PLM) per NYSDOH. This Method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite.
denotes material analyzed by ELAP Method 198.6 (PLM) and 198.4 (TEM) as noted.
X denotes sample prepped only by ELAP Method 198.6.
ND in the TEM Total Asbestos column denotes None Detected as described in ELAP Method 198.4, Sec. 6.3.2.2 & 4.1.3.
**** Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.**

PLM Bulk Asbestos Analysis by New York State Department of Health, ELAP Method 198.1 ,198.4 and 198.6 ("Polarized Light Microscopy and Transmission Electron Microscopy Methods for Identifying and Quantitating Asbestos in Bulk Samples and in Non-Friable Organically Bound Bulk Samples.")or EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab Code 200530-0).

NVLAP TESTING
Lab Code 200530-0 for PLM Analysis

ELAP ID: 10958

Microscope: Olympus BH-2 #211874
PLM Analyst: T. Bush
Date of Analysis: 2/5/2026

Microscope: JEOL-100CX-II #EM-156094-87
TEM Analyst: A. Voldbakken
Date of Analysis: 2/9/2026

Laboratory Results Approved By:
Asbestos Technical Director or Designee Fernanda Weinman

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PARADIGM
ENVIRONMENTAL SERVICES

179 Lake Avenue, Rochester, NY 14608 Office: (585) 647-2530

PLM & TEM BULK ASBESTOS ANALYSIS REPORT
via NYSDOH ELAP Method 198.1,198.4 and 198.6

Client: Tetra Tech Architects & Engineers
Job No: 0487-26
Location: Waverly Central School Distric, Elm Street PH2
Elm Street Elementary School, 338070-25002

Sample Date: 1/28/2026

Client ID	Lab ID	Sampling Location	Description	PLM Asbestos Fibers Type & Percentage	PLM Total Asbestos	NOB	TEM Asbestos Fibers Type & Percentage	TEM Total Asbestos	PLM Non-Asbestos Fibers Type & Percentage	Non-Fibrous Matrix Material %
12826E-11	4910	Dishwashing	Gray Ceramic Wall Tile Grout	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-12	4911	Dishwashing	Gray Ceramic Wall Tile Mudset	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-13	4912	Cafeteria	Gray Quarry Tile Mortar/Grout	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-14	4913	Cafeteria	Gray Quarry Tile Mortar/Grout	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-15	4914	Girls Locker Room	Gray Quarry Tile Mortar/Grout	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-16	4915	Girls Locker Room	White Ceramic Wall Tile/Base Grout	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-17	4916	Girls Locker Room	White Ceramic Wall Tile/Base Grout	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-18	4917	Girls Locker Room	White Ceramic Wall Tile/Base Mortar	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-19	4918	Girls Locker Room	White Ceramic Wall Tile/Base Mortar	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-20	4919	Girls Locker Room	Gray Mosaic Ceramic Floor Tile Grout	None Detected	0%		Not Required	N/A	None Detected	100%

KEY
No Symbol in the NOB column denotes sample analyzed by ELAP Method 198.1 (PLM).
√ NOB (non-friable organically bound) denotes material analyzed by ELAP Method 198.6 (PLM) and 198.4 (TEM) as noted.
Ṽ denotes material analyzed by ELAP Method 198.6 (PLM) per NYSDOH. This Method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite.
denotes material analyzed by ELAP Method 198.6 (PLM) and 198.4 (TEM) as noted.
X denotes sample prepped only by ELAP Method 198.6.
ND in the TEM Total Asbestos column denotes None Detected as described in ELAP Method 198.4, Sec. 6.3.2.2 & 4.1.3.
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NVLAP TESTING
Lab Code 200530-0 for PLM Analysis

ELAP ID: 10958

Microscope: Olympus BH-2 #211874
PLM Analyst: T. Bush
Date of Analysis: 2/5/2026

Microscope: JEOL-100CX-II #EM-156094-87
TEM Analyst: N/A
Date of Analysis: N/A

Laboratory Results Approved By:
Asbestos Technical Director or Designee Fernanda Weinman

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PARADIGM
ENVIRONMENTAL SERVICES

179 Lake Avenue, Rochester, NY 14608 Office: (585) 647-2530

PLM & TEM BULK ASBESTOS ANALYSIS REPORT
via NYSDOH ELAP Method 198.1,198.4 and 198.6

Client: Tetra Tech Architects & Engineers
Job No: 0487-26
Location: Waverly Central School Distric, Elm Street PH2
Elm Street Elementary School, 338070-25002

Sample Date: 1/28/2026

Client ID	Lab ID	Sampling Location	Description	PLM Asbestos Fibers Type & Percentage	PLM Total Asbestos	NOB	TEM Asbestos Fibers Type & Percentage	TEM Total Asbestos	PLM Non-Asbestos Fibers Type & Percentage	Non-Fibrous Matrix Material %
12826E-21	4920	Girls Locker Room	Gray Mosaic Ceramic Floor Tile Grout	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-22	4921	Girls Locker Room	Gray Mosaic Ceramic Floor Tile Mudset	None Detected	0%		Not Required	N/A	None Detected	100%
12826E-23	4922	Girls Locker Room	Gray Mosaic Ceramic Floor Tile Mudset	None Detected	0%		Not Required	N/A	None Detected	100%

KEY
No Symbol in the NOB column denotes sample analyzed by ELAP Method 198.1 (PLM).
√ NOB (non-friable organically bound) denotes material analyzed by ELAP Method 198.6 (PLM) and 198.4 (TEM) as noted.
V̈ denotes material analyzed by ELAP Method 198.6 (PLM) per NYSDOH. This Method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite.
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**** Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.**

PLM Bulk Asbestos Analysis by New York State Department of Health, ELAP Method 198.1 ,198.4 and 198.6 ("Polarized Light Microscopy and Transmission Electron Microscopy Methods for Identifying and Quantitating Asbestos in Bulk Samples and in Non-Friable Organically Bound Bulk Samples.")or EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab Code 200530-0).

NVLAP TESTING
Lab Code 200530-0 for PLM Analysis

ELAP ID: 10958

Microscope: Olympus BH-2 #211874
PLM Analyst: T. Bush
Date of Analysis: 2/5/2026

Microscope: JEOL-100CX-II #EM-156094-87
TEM Analyst: N/A
Date of Analysis: N/A

Laboratory Results Approved By: Fernanda Weinman
Asbestos Technical Director or Designee

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TETRA TECH
ARCHITECTS & ENGINEERS

Email Results & Invoice to:
Tim Thomas
10 Brown Rd
Ithaca, New York 14850
Cell: (315) 440-7143
Tim.thomas2@tetratech.com

0487-26
1 of 1
4 & 4 S

Sample Log & Chain of Custody

PROJECT NAME: Waverly CSD - Elm St Ph2
PROJECT NO.: 338070-25002
BUILDING: Elm St ES
DATE: 1/28/2026

Sample Number		Group	Material	Sample Location	Vintage
4900	12826E- 01		Overhead Door Frame Caulk - Old/Cracked White	Receviing	1939
901	12826E- 02		Overhead Door Frame Caulk - Old/Cracked White	Receviing	1939
902	12826E- 03		Interior Door Glazing Compound - Black	Receviing	Renov
903	12826E- 04		Interior Door Glazing Compound - Black	Clrm 122	Renov
904	12826E- 05		2x2 Ceiling Tile - Tegular Pin/Dot	Clrm 121	2025
905	12826E- 06		2x2 Ceiling Tile - Tegular Pin/Dot	Library Storage	2025
906	12826E- 07		Sink Undercoating - Lt Grey	Clrm 121	Renov
907	12826E- 08		Sink Undercoating - Lt Grey	Clrm 121	Renov
908	12826E- 09		Ceramic Wall Tile Grout	Dishwashing	Renov
909	12826E- 10		Ceramic Wall Tile Mudset	Dishwashing	Renov
910	12826E- 11		Ceramic Wall Tile Grout	Dishwashing	Renov
911	12826E- 12		Ceramic Wall Tile Mudset	Dishwashing	Renov
912	12826E- 13		Quarry Tile Moartar/Grout	Cafeteria	1939
913	12826E- 14		Quarry Tile Moartar/Grout	Cafeteria	1939
914	12826E- 15		Quarry Tile Moartar/Grout	Girls Locker Room	1939
915	12826E- 16		White Ceramic Wall Tile /Base Grout	Girls Locker Room	1939
916	12826E- 17		White Ceramic Wall Tile /Base Grout	Girls Locker Room	1939
917	12826E- 18		White Ceramic Wall Tile /Base Mortar	Girls Locker Room	1939
918	12826E- 19		White Ceramic Wall Tile /Base Mortar	Girls Locker Room	1939
919	12826E- 20		Mosaic Ceramic Floor Tile Grout	Girls Locker Room	1939
920	12826E- 21		Mosaic Ceramic Floor Tile Grout	Girls Locker Room	1939
921	12826E- 22		Mosaic Ceramic Floor Tile Mudset	Girls Locker Room	1939
922	12826E- 23		Mosaic Ceramic Floor Tile Mudset	Girls Locker Room	1939

#Samples: 23 Relinq.: Timothy Thomas Date: 1/28/2026

Samples: ___ Received: Date:

Samples: ___ Received: Date: 2.2.26 1215

Analysis

- NOB Analysis - As Required by ELAP - Matrix reduction / PLM / TEM Confirmation As Necessary
- Other than NOB - PLM Only
- Layered Sample Analysis - Lab to separate layers and analyze separately

Turn Around Time: 5 Day
2.9

PARADIGM
ENVIRONMENTAL SERVICES

179 Lake Avenue, Rochester, NY 14608 Office: (585) 647-2530

PLM & TEM BULK ASBESTOS ANALYSIS REPORT
via NYSDOH ELAP Method 198.1,198.4 and 198.6

Client: Tetra Tech Architects and Engineers
Location: Waverly Central School District, 338070-25002
Elm Street Elementary School
Sample Date: 3/11/2026

Job No: 1341-26

Client ID	Lab ID	Sampling Location	Description	PLM Asbestos Fibers Type & Percentage	PLM Total Asbestos	NOB	TEM Asbestos Fibers Type & Percentage	TEM Total Asbestos	PLM Non-Asbestos Fibers Type & Percentage	Non-Fibrous Matrix Material %
31126-01	14695	Middle Entryway	White Hard Window Infill Caulk	Inconclusive No Asbestos Detected	0%	#	None Detected	ND	None Detected	100%
31126-02	14696	Middle Entryway	White Hard Window Infill Caulk	Inconclusive No Asbestos Detected	0%	#	None Detected	ND	None Detected	100%
31126-03	14697	Middle Entryway	Brown Soft Window Infill Caulk	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-04	14698	Middle Entryway	Brown Soft Window Infill Caulk	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-05	14699	Classroom 122	Tan Mottled 12"x12" Floor Tile	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-06	14700	Classroom 122	Yellow Floor Tile Mastic and Floor Leveler	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-07	14701	Classroom 122	Yellow Floor Tile Mastic and Floor Leveler	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-08	14702	114B	Tan Mottled 12"x12" Floor Tile	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-09	14703	114B	Black Hardwood Floor Paper Vapor Barrier	<1.0% Residue Remaining. PLM and TEM Not Required.	N/A	X	N/A	N/A	N/A	N/A
31126-10	14704	114B	Black Hardwood Floor Paper Vapor Barrier	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%

KEY
No Symbol in the NOB column denotes sample analyzed by ELAP Method 198.1 (PLM).
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V̂ denotes material analyzed by ELAP Method 198.6 (PLM) per NYSDOH. This Method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite.
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ND in the TEM Total Asbestos column denotes None Detected as described in ELAP Method 198.4, Sec. 6.3.2.2 & 4.1.3.
**** Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials.**
Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

PLM Bulk Asbestos Analysis by New York State Department of Health, ELAP Method 198.1 ,198.4 and 198.6 ("Polarized Light Microscopy and Transmission Electron Microscopy Methods for Identifying and Quantitating Asbestos in Bulk Samples and in Non-Friable Organically Bound Bulk Samples.")or EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab Code 200530-0).

NVLAP TESTING
Lab Code 200530-0 for PLM Analysis

ELAP ID: 10958

Microscope: Olympus BH-2 #221797
PLM Analyst: K. Acosta
Date of Analysis: 3/16/2026

Microscope: JEOL-100CX-II #EM-156094-87
TEM Analyst: M. Lochner
Date of Analysis: 3/19/2026

Laboratory Results Approved By:
Asbestos Technical Director or Designee Fernanda Weinman

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PARADIGM
ENVIRONMENTAL SERVICES

179 Lake Avenue, Rochester, NY 14608 Office: (585) 647-2530

PLM & TEM BULK ASBESTOS ANALYSIS REPORT
via NYSDOH ELAP Method 198.1,198.4 and 198.6

Client: Tetra Tech Architects and Engineers
Job No: 1341-26
Location: Waverly Central School District, 338070-25002
Elm Street Elementary School

Sample Date: 3/11/2026

Client ID	Lab ID	Sampling Location	Description	PLM Asbestos Fibers Type & Percentage	PLM Total Asbestos	NOB	TEM Asbestos Fibers Type & Percentage	TEM Total Asbestos	PLM Non-Asbestos Fibers Type & Percentage	Non-Fibrous Matrix Material %
31126-11	14705	114B	Gray Concrete Subfloor/Topping	None Detected	0%		Not Required	N/A	None Detected	100%
31126-12	14706	114B	Gray Concrete Subfloor/Topping	None Detected	0%		Not Required	N/A	None Detected	100%
31126-13	14707	Main Office	Dark Gray Carpet Tile Mastic	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-14	14708	Main Office	Dark Gray Carpet Tile Mastic	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-15	14709	Main Office	Gray Infilled Concrete Subfloor	None Detected	0%		Not Required	N/A	None Detected	100%
31126-16	14710	Main Office	Gray Infilled Concrete Subfloor	None Detected	0%		Not Required	N/A	None Detected	100%
31126-17	14711	Main Office	White Mottled 12"x12" Floor Tile	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-18	14712	Main Office	Red Mottled 12"x12" Floor Tile	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-19	14713	Principal	Blue/Green Carpet Tile Mastic	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%
31126-20	14714	Principal	Blue/Green Carpet Tile Mastic	Inconclusive No Asbestos Detected	0%	√	None Detected	ND	None Detected	100%

KEY
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NVLAP TESTING
Lab Code 200530-0 for PLM Analysis

ELAP ID: 10958

Microscope: Olympus BH-2 #221797
PLM Analyst: K. Acosta
Date of Analysis: 3/16/2026

Microscope: JEOL-100CX-II #EM-156094-87
TEM Analyst: M. Lochner
Date of Analysis: 3/19/2026

Laboratory Results Approved By:
Asbestos Technical Director or Designee Fernanda Weinman

Paradigm Environmental Services, Inc. is not responsible for the data supplied by an independent inspector. National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the laboratory. This PLM report relates ONLY to the items tested. This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Quality control data (including 95% confidence limits and/or laboratory and analysts' precision) is available upon request. All samples that were analyzed were received in acceptable condition.

PARADIGM
ENVIRONMENTAL SERVICES

179 Lake Avenue, Rochester, NY 14608 Office: (585) 647-2530

PLM & TEM BULK ASBESTOS ANALYSIS REPORT
via NYSDOH ELAP Method 198.1,198.4 and 198.6

Client: Tetra Tech Architects and Engineers
Job No: 1341-26
Location: Waverly Central School District, 338070-25002
Elm Street Elementary School

Sample Date: 3/11/2026

Client ID	Lab ID	Sampling Location	Description	PLM Asbestos Fibers Type & Percentage	PLM Total Asbestos	NOB	TEM Asbestos Fibers Type & Percentage	TEM Total Asbestos	PLM Non-Asbestos Fibers Type & Percentage	Non-Fibrous Matrix Material %
31126-21	14715	Library	Clear/Residual Black Carpet Tile Mastic	Chrysotile 5.6%	5.6%	√	Not Required	N/A	None Detected	94.4%
31126-22	14716	Library	Clear/Residual Black Carpet Tile Mastic	Inconclusive Trace Chrysotile Detected	<1.0%	√	Trace Chrysotile <1.0%	<1.0%	None Detected	100%

KEY
No Symbol in the NOB column denotes sample analyzed by ELAP Method 198.1 (PLM).
√ NOB (non-friable organically bound) denotes material analyzed by ELAP Method 198.6 (PLM) and 198.4 (TEM) as noted.
V̂ denotes material analyzed by ELAP Method 198.6 (PLM) per NYSDOH. This Method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite.
denotes material analyzed by ELAP Method 198.6 (PLM) and 198.4 (TEM) as noted.
X denotes sample prepped only by ELAP Method 198.6.
ND in the TEM Total Asbestos column denotes None Detected as described in ELAP Method 198.4, Sec. 6.3.2.2 & 4.1.3.
**** Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.**

PLM Bulk Asbestos Analysis by New York State Department of Health, ELAP Method 198.1 ,198.4 and 198.6 ("Polarized Light Microscopy and Transmission Electron Microscopy Methods for Identifying and Quantitating Asbestos in Bulk Samples and in Non-Friable Organically Bound Bulk Samples.")or EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab Code 200530-0).

NVLAP TESTING
Lab Code 200530-0 for PLM Analysis

ELAP ID: 10958

Microscope: Olympus BH-2 #221797
PLM Analyst: K. Acosta
Date of Analysis: 3/16/2026

Microscope: JEOL-100CX-II #EM-156094-87
TEM Analyst: M. Lochner
Date of Analysis: 3/19/2026

Laboratory Results Approved By:
Asbestos Technical Director or Designee Fernanda Weinman

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TETRA TECH
ARCHITECTS & ENGINEERS

Email Results & Invoice to:

Tim Thomas
10 Brown Rd
Ithaca, New York 14850
Cell: (315) 440-7143
Tim.thomas2@tetratech.com

1341-26
1 of 1
COC

Sample Log & Chain of Custody

PROJECT NAME: Waverly CSD - Elm St Ph2
PROJECT NO.: 338070-25002

BUILDING: Elm St ES
DATE: 3/11/2026

Sample Number		Group	Material	Sample Location	Vintage
14695	31126- 01		Window Infill Caulk - hard white	Middle Entryway	Renovation
696	31126- 02		Window Infill Caulk - hard white	Middle Entryway	Renovation
697	31126- 03		Window Infill Caulk - Soft Brown	Middle Entryway	Renovation
698	31126- 04		Window Infill Caulk - Soft Brown	Middle Entryway	Renovation
699	31126- 05		12x12 Floor Tile - Tan Mottled	Clrm 122	Renovation
700	31126- 06		Floor Tile Mastic - Yellow & Floor Leveler (Grey)	Clrm 122	Renovation
701	31126- 07		Floor Tile Mastic - Yellow & Floor Leveler (Grey)	Clrm 122	Renovation
702	31126- 08		12x12 Floor Tile - Tan Mottled	114B	Renovation
703	31126- 09		Hardwood Floor Paper Vapor Barrier	114B	1939
704	31126- 10		Hardwood Floor Paper Vapor Barrier	114B	1939
705	31126- 11		Concrete Subfloor/topping	114B	1939
706	31126- 12		Concrete Subfloor/topping	114B	1939
707	31126- 13		Carpet Tile Mastic - Dark Grey	Main Office	2008
708	31126- 14		Carpet Tile Mastic - Dark Grey	Main Office	2008
709	31126- 15		Infilled Concrete Subfloor	Main Office	2008
710	31126- 16		Infilled Concrete Subfloor	Main Office	2008
711	31126- 17		12x12 Floor Tile - White Mottled	Main Office	2008
712	31126- 18		12x12 Floor Tile - Red Mottled	Main Office	2008
713	31126- 19		Carpet Tile Mastic - Bluegreen	Principal	Renovation
714	31126- 20		Carpet Tile Mastic - Bluegreen	Principal	Renovation
715	31126- 21		Carpet Tile Mastic - Clear w/ residual black	Library	Renovation
716	31126- 22		Carpet Tile Mastic - Clear w/ residual black	Library	Renovation

#Samples: 22 — Relinq.: Timothy Thomas — Date: 3/11/2026

Samples: ___ — Received: — Date: 3.13.26 1105

Samples: ___ — Received: — Date:

Analysis

- NOB Analysis - As Required by ELAP - Matrix reduction / PLM / TEM Confirmation As Necessary
- Other than NOB - PLM Only
- Layered Sample Analysis - Lab to separate layers and analyze separately

Turn Around Time: 5 Day
3.20

PARADIGM
ENVIRONMENTAL SERVICES, INC

Analytical Report For

Tetra Tech

For Lab Project ID

260355

Referencing

Waverly CSD - Elm St

Prepared

Monday, February 9, 2026

Any noncompliant QC parameters or other notes impacting data interpretation are flagged or documented on the final report or are noted below.

Emily Farmer

Certifies that this report has been approved by the Technical Director or Designee

179 Lake Avenue • Rochester, NY 14608 • (585) 647-2530 • Fax (585) 647-3311 • ELAP ID# 10958

This report is part of a multipage document and should only be evaluated in its entirety. The Chain of Custody provides additional sample information, including compliance with the sample condition requirements upon receipt.

PARADIGM ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 260355

Client: **Tetra Tech**

Project Reference: Waverly CSD - Elm St

Sample Identifier: 12826E-1 Overhead Door Frame Caulk - Old/Cracked White
Lab Sample ID: 260355-01 **Date Sampled:** 1/28/2026
Matrix: Caulk **Date Received** 2/2/2026

Mercury

Analyte	Result	Units	Qualifier	Date Analyzed
Mercury	**0.0300**	mg/Kg		2/6/2026 15:37

Method Reference(s): EPA 7471B
Preparation Date: 2/6/2026
Data File: Hg260206A

RCRA Metals (ICP)

Analyte	Result	Units	Qualifier	Date Analyzed
Arsenic	**29.2**	mg/Kg		2/4/2026 09:05
Barium	**777**	mg/Kg		2/4/2026 09:05
Cadmium	**8.57**	mg/Kg		2/4/2026 09:05
Chromium	**31.0**	mg/Kg		2/4/2026 09:05
Lead	**32000**	mg/Kg		2/5/2026 07:07
Selenium	< 0.971	mg/Kg		2/4/2026 09:05
Silver	< 0.485	mg/Kg		2/4/2026 09:05

Method Reference(s): EPA 6010C
EPA 3050B
Preparation Date: 2/3/2026
Data File: 260204A

PCBs

Analyte	Result	Units	Qualifier	Date Analyzed
PCB-1016	< 3.65	mg/Kg		2/3/2026 13:20
PCB-1221	< 3.65	mg/Kg		2/3/2026 13:20
PCB-1232	< 3.65	mg/Kg		2/3/2026 13:20
PCB-1242	< 3.65	mg/Kg		2/3/2026 13:20
PCB-1248	< 3.65	mg/Kg		2/3/2026 13:20
PCB-1254	< 3.65	mg/Kg		2/3/2026 13:20
PCB-1260	< 3.65	mg/Kg		2/3/2026 13:20
PCB-1262	< 3.65	mg/Kg		2/3/2026 13:20
PCB-1268	< 3.65	mg/Kg		2/3/2026 13:20

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PARADIGM ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 260355

Client: **Tetra Tech**

Project Reference: Waverly CSD - Elm St

Sample Identifier:	12826E-1 Overhead Door Frame Caulk - Old/Cracked White		
Lab Sample ID:	260355-01	**Date Sampled:**	1/28/2026
Matrix:	Caulk	**Date Received**	2/2/2026

Surrogate	Percent Recovery	Limits	Outliers	Date Analyzed
Tetrachloro-m-xylene	**79.6**	10 - 110		2/3/2026 13:20

Method Reference(s): EPA 8082A
EPA 3546

Preparation Date: 2/2/2026

Analytical Report Appendix

The reported results relate only to the samples as they have been received by the laboratory.

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All soil/sludge samples have been reported on a dry weight basis, unless qualified "reported as received". Other solids are reported as received.

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NYSDOH ELAP does not certify for all parameters. Paradigm Environmental Services or the indicated subcontracted laboratory does hold certification for all analytes where certification is offered by ELAP unless otherwise specified. Aliquots separated for certain tests, such as TCLP, are indicated on the Chain of Custody and final reports with an "A" suffix.

Data qualifiers are used, when necessary, to provide additional information about the data. This information may be communicated as a flag or as text at the bottom of the report. Please refer to the following list of analyte-specific, frequently used data flags and their meaning:

"<" = Analyzed for but not detected at or above the quantitation limit.
"E" = Result has been estimated, calibration limit exceeded.
"H" = Denotes a parameter analyzed outside of holding time.
"Z" = See case narrative.
"D" = Sample, Laboratory Control Sample, or Matrix Spike Duplicate results above Relative Percent Difference limit.
"M" = Matrix spike recoveries outside QC limits. Matrix bias indicated.
"B" = Method blank contained trace levels of analyte. Refer to included method blank report.
"J" = Result estimated between the quantitation limit and half the quantitation limit.
"L" = Laboratory Control Sample recovery outside accepted QC limits.
"P" = Concentration differs by more than 40% between the primary and secondary analytical columns.
"NC" = Not calculable. Applicable to RPD if sample or duplicate result is non-detect or estimated (see primary report for data flags). Applicable to MS if sample is greater or equal to ten times the spike added. Applicable to sample surrogates or MS if sample dilution is 10x or higher.
"" = Indicates any recoveries outside associated acceptance windows. Surrogate outliers in samples are presumed matrix effects. LCS demonstrates method compliance unless otherwise noted.*
"(1)" = Indicates data from primary column used for QC calculation.
"A" = denotes a parameter for which ELAP does not offer approval as part of their laboratory certification program.
"F" = denotes a parameter for which Paradigm does not carry certification, the results for which should therefore only be used where ELAP certification is not required, such as personal exposure assessment.

GENERAL TERMS AND CONDITIONS
LABORATORY SERVICES

These Terms and Conditions embody the whole agreement of the parties in the absence of a signed and executed contract between the Laboratory (LAB) and Client. They shall supersede all previous communications, representations, or agreements, either verbal or written, between the parties. The LAB specifically rejects all additional, inconsistent, or conflicting terms, whether printed or otherwise set forth in any purchase order or other communication from the Client to the LAB. The invalidity or unenforceability in whole or in part of any provision, term or condition hereof shall not affect in any way the validity or enforceability of the remainder of the Terms and Conditions. No waiver by LAB of any provision, term, or condition hereof or of any breach by or obligation of the Client hereunder shall constitute a waiver of such provision, term, or condition on any other occasion or a waiver of any other breach by or obligation of the Client. This agreement shall be administered and interpreted under the laws of the state which services are procured.

Warranty. Recognizing that the nature of many samples is unknown and that some may contain potentially hazardous components, LAB warrants only that it will perform testing services, obtain findings, and prepare reports in accordance with generally accepted analytical laboratory principles and practices at the time of performance of services. LAB makes no other warranty, express or implied.

Scope and Compensation. LAB agrees to perform the services described in the chain of custody to which these terms and conditions are attached. Unless the parties agree in writing to the contrary, the duties of LAB shall not be construed to exceed the services specifically described. LAB wi use LAB default method for all tests unless specified otherwise on the Work Order.
Payment terms are net 30 days from the date of invoice. All overdue payments are subject to an interest charge of one and one-half percent (1-1/2%) per month or a portion thereof. Client shall also be responsible for costs of collection, including payment of reasonable attorney fees if such expense is incurred. The prices, unless stated, do not include any sale, use or other taxes. Such taxes will be added to invoice prices when required.

Prices. Compensation for services performed will be based on the current Lab Analytical Fee Schedule or on quotations agreed to in writing by the parties. Turnaround time based charges are determined from the time of resolution of all work order questions. Testimony, court appearances or data compilation for legal action will be charged separately. Evaluation and reporting of initial screening runs may incur additional fees.

Limitations of Liability. In the event of any error, omission, or other professional negligence, the sole and exclusive responsibility of LAB shall be to re-perform the deficient work at its own expense and LAB shall have no other liability whatsoever. All claims shall be deemed waived unless made in writing and received by LAB within ninety (90) days following completion of services.
LAB shall have no liability, obligation, or responsibility of any kind for losses, costs, expenses, or other damages (including but not limited to any special, direct, incidental or consequential damages) with respect to LAB's services or results.
All results provided by LAB are strictly for the use of its clients and LAB is in no way responsible for the use of such results by clients or third parties. All reports should be considered in their entirety, and LAB is not responsible for the separation, detachment, or other use of any portion of these reports. Client may not assign the lab report without the written consent of the LAB.
Client covenants and agrees, at its/his/her sole expense, to indemnify, protect, defend, and save harmless the LAB from and against any and all damages, losses, liabilities, obligations, penalties, claims, litigation, demands, defenses, judgments, suits, actions, proceedings, costs, disbursements and/or expenses (including, without limitation attorneys' and experts' fees and disbursements) of any kind whatsoever which may at any time be imposed upon, incurred by or asserted or awarded against client relating to, resulting from or arising out of (a) the breach of this agreement by this client, (b) the negligence of the client in handling, delivering or disclosing any hazardous substance, (c) the violation of the Client of any applicable law, (d) non-compliance by the Client with any environmental permit or (e) a material misrepresentation in disclosing the materials to be tested.

Hazard Disclosure. Client represents and warrants that any sample delivered to LAB will be preceded or accompanied by complete written disclosure of the presence of any hazardous substances known or suspected by Client. Client further warrants that any sample containing any hazardous substance that is to be delivered to LAB will be packaged, labeled, transported, and delivered properly and in accordance with applicable laws.

Sample Handling. Prior to LAB's acceptance of any sample (or after any revocation of acceptance), the entire risk of loss or of damage to such sample remains with Client. Samples are accepted when receipt is acknowledged on chain of custody documentation. In no event will LAB have any responsibility for the action or inaction of any carrier shipping or delivering any sample to or from LAB premises.
Client authorizes LAB to proceed with the analysis of samples as received by the laboratory, recognizing that any samples not in compliance with all current DOH-ELAP-NELAP requirements for containers, preservation or holding time will be noted as such on th final report.
Disposal of hazardous waste samples is the responsibility of the Client. If the Client does not wish such samples returned, LAB may add storage and disposal fees to the final invoice. Maximum storage time for samples is 30 days after completion of analysis unless modified by applicable state or federal laws. Client will be required to give the LAB written instructions concerning disposal of these samples.
LAB reserves the absolute right, exercisable at any time, to refuse to receive delivery of, refuse to accept, or revoke acceptance of any sample, which, in the sole judgment of LAB (a) is of unsuitable volume, (b) may be or become unsuitable for or may pose a risk in handling, transport, or processing for any health, safety, environmental or other reason whether or not due to the presence in the sample of any hazardous substance, and whether or not such presence has been disclosed to LAB by Client or (c) if the condition or sample date make the sample unsuitable for analysis.

Legal Responsibility. LAB is solely responsible for performance of this contract, and no affiliated company, director, officer, employee, or agent shall have any legal responsibility hereunder, whether in contract or tort including negligence.

Assignment. LAB may assign its performance obligations under this contract to other parties, as it deems necessary. LAB shall disclose to Client any assignee (subcontractor) by ELAP ID # on the submitted final report.

Force Majeure. LAB shall have no responsibility or liability to the Client for any failure or delay in performance by LAB, which results in whole or in part from any cause or circumstance beyond the reasonable control of LAB. Such causes and circumstances shall include, but not limited to, acts of God, acts or orders of any government authority, strikes or other labor disputes, natural disasters, accidents, wars, civil disturbances, difficulties or delays in transportation, mail or delivery services, inability to obtain sufficient services or supplies from LAB's usual suppliers, or any other cause beyond LAB's reasonable control.

Law. This contract shall be continued under the laws of the State of New York without regard to its conflicts of laws provision.

179 Lake Avenue, Rochester, NY 14608 Office (585) 647-2530 Fax (585) 647-3311

1 of 2

CHAIN OF CUSTODY

REPORT TO:		INVOICE TO:		LAB PROJECT ID
CLIENT:	Tetra Tech	CLIENT:	Same	260355
ADDRESS:	10 Brown Rd	ADDRESS:		Quotation #:
CITY:	Ithaca STATE: NY ZIP 14850	CITY:	STATE: ZIP:	
PHONE:	315.440.7143	PHONE:		Email:
ATTN:	Timothy Thomas	ATTN:		tim.thomas2@tetratech.com

PROJECT REFERENCE

Waverly CSD - Elm St

Matrix Codes:

AQ - Aqueous Liquid; NQ - Non-Aqueous Liquid; WA - Water; WG - Groundwater; DW - Drinking Water; WW - Wastewater; SO - Soil; SL - Sludge; SD - Solid; PT - Paint; WP - Wipe; CK - Caulk; OL - Oil; AR - Air

REQUESTED ANALYSIS

DATE COLLECTED	TIME COLLECTED	COMPOSITE	GRAB	SAMPLE IDENTIFIER	MATRIX CODES	NUMBER OF CONTAINERS	PCBs **	RCRA Metals									REMARKS	PARADIGM LAB SAMPLE NUMBER
1/28/2026			X	12826E-1 Overhead DoorFrame Caulk - Old/Cracked White	CK	1	X	X										01

** All PCBs analysis to have Limit of Detection / Quantitation limit of 5 PPM (mg/Kg) or lower

Turnaround Time		Report Supplements			
Availability contingent upon lab approval; additional fees may apply.					
Standard 5 day	X	None Required		None Required	
10 day		Batch QC		Basic EDD	
Rush 3 day		Category A		NYSDEC EDD	
Rush 2 day		Category B			
Rush 1 day					
Other		Other		Other EDD	
please indicate date needed:		please indicate package needed:		please indicate EDD needed:	

Tim Thomas — Sampled By — 1/28/2026 Date/Time

Total Cost:

Relinquished By — Date/Time

Received By — Date/Time — 2/2/26 12:18

P.I.F.

Received @ Lab By — Date/Time

16.6 °C 2/2/26 12:15

By signing this form, client agrees to Paradigm Terms and Conditions (reverse).

Please submit report indicating "Tetra Tech" as the client.

PARADIGM
ENVIRONMENTAL SERVICES

Chain of Custody Supplement

Client: Tetra Tech **Completed by:** [signature]

Lab Project ID: 260355 **Date:** 2/17/2026

Sample Condition Requirements

Per NELAC/ELAP 210/241/242/243/244

Condition	*NELAC compliance with the sample condition requirements upon receipt* Yes	No	N/A
Container Type	☑	☐	☐
Comments			
Transferred to method-compliant container	☐	☐	☒
Headspace (<1 mL)	☐	☐	☑
Comments			
Preservation	☐	☐	☑
Comments			
Chlorine Absent (<0.10 ppm per test strip)	☐	☐	☑
Comments			
Holding Time	☒	☐	☐
Comments			
Temperature	☐	☒	☑ Metals (200.8)
Comments	16.6°C		
Compliant Sample Quantity/Type	☒	☐	☐
Comments			

PARADIGM
ENVIRONMENTAL SERVICES, INC

Analytical Report For

Tetra Tech

For Lab Project ID

260888

Referencing

Waverly CSD - Elm St

Prepared

Friday, March 20, 2026

Any noncompliant QC parameters or other notes impacting data interpretation are flagged or documented on the final report or are noted below.

Certifies that this report has been approved by the Technical Director or Designee

179 Lake Avenue • Rochester, NY 14608 • (585) 647-2530 • Fax (585) 647-3311 • ELAP ID# 10958

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PARADIGM ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 260888

Client: **Tetra Tech**

Project Reference: Waverly CSD - Elm St

Sample Identifier: 31126-1 Window Infill Caulk - Hard White/Soft Brown
Lab Sample ID: 260888-01 **Date Sampled:** 3/11/2026
Matrix: Caulk **Date Received** 3/13/2026

Mercury

Analyte	Result	Units	Qualifier	Date Analyzed
Mercury	< 0.00718	mg/Kg		3/17/2026 10:42

Method Reference(s): EPA 7471B
Preparation Date: 3/16/2026
Data File: Hg260317A

RCRA Metals (ICP)

Analyte	Result	Units	Qualifier	Date Analyzed
Arsenic	< 0.481	mg/Kg		3/17/2026 08:50
Barium	< 4.81	mg/Kg		3/17/2026 08:50
Cadmium	< 0.240	mg/Kg		3/17/2026 08:50
Chromium	**0.808**	mg/Kg		3/17/2026 08:50
Lead	**4.28**	mg/Kg		3/17/2026 08:50
Selenium	< 0.962	mg/Kg		3/17/2026 08:50
Silver	< 0.481	mg/Kg		3/17/2026 08:50

Method Reference(s): EPA 6010C
EPA 3050B
Preparation Date: 3/16/2026
Data File: 260317A

PCBs

Analyte	Result	Units	Qualifier	Date Analyzed
PCB-1016	< 2.23	mg/Kg		3/19/2026 16:52
PCB-1221	< 2.23	mg/Kg		3/19/2026 16:52
PCB-1232	< 2.23	mg/Kg		3/19/2026 16:52
PCB-1242	< 2.23	mg/Kg		3/19/2026 16:52
PCB-1248	< 2.23	mg/Kg		3/19/2026 16:52
PCB-1254	< 2.23	mg/Kg		3/19/2026 16:52
PCB-1260	< 2.23	mg/Kg		3/19/2026 16:52
PCB-1262	< 2.23	mg/Kg		3/19/2026 16:52
PCB-1268	< 2.23	mg/Kg		3/19/2026 16:52

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PARADIGM ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 260888

Client: **Tetra Tech**

Project Reference: Waverly CSD - Elm St

Sample Identifier:	31126-1 Window Infill Caulk - Hard White/Soft Brown		
Lab Sample ID:	260888-01	**Date Sampled:**	3/11/2026
Matrix:	Caulk	**Date Received**	3/13/2026

Surrogate	Percent Recovery	Limits	Outliers	Date Analyzed
Tetrachloro-m-xylene	**72.9**	10 - 110		3/19/2026 16:52

Method Reference(s): EPA 8082A
EPA 3546

Preparation Date: 3/19/2026

Analytical Report Appendix

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"Z" = See case narrative.
"D" = Sample, Laboratory Control Sample, or Matrix Spike Duplicate results above Relative Percent Difference limit.
"M" = Matrix spike recoveries outside QC limits. Matrix bias indicated.
"B" = Method blank contained trace levels of analyte. Refer to included method blank report.
"J" = Result estimated between the quantitation limit and half the quantitation limit.
"L" = Laboratory Control Sample recovery outside accepted QC limits.
"P" = Concentration differs by more than 40% between the primary and secondary analytical columns.
"NC" = Not calculable. Applicable to RPD if sample or duplicate result is non-detect or estimated (see primary report for data flags). Applicable to MS if sample is greater or equal to ten times the spike added. Applicable to sample surrogates or MS if sample dilution is 10x or higher.
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GENERAL TERMS AND CONDITIONS
LABORATORY SERVICES

These Terms and Conditions embody the whole agreement of the parties in the absence of a signed and executed contract between the Laboratory (LAB) and Client. They shall supersede all previous communications, representations, or agreements, either verbal or written, between the parties. The LAB specifically rejects all additional, inconsistent, or conflicting terms, whether printed or otherwise set forth in any purchase order or other communication from the Client to the LAB. The invalidity or unenforceability in whole or in part of any provision, term or condition hereof shall not affect in any way the validity or enforceability of the remainder of the Terms and Conditions. No waiver by LAB of any provision, term, or condition hereof or of any breach by or obligation of the Client hereunder shall constitute a waiver of such provision, term, or condition on any other occasion or a waiver of any other breach by or obligation of the Client. This agreement shall be administered and interpreted under the laws of the state which services are procured.

Warranty. Recognizing that the nature of many samples is unknown and that some may contain potentially hazardous components, LAB warrants only that it will perform testing services, obtain findings, and prepare reports in accordance with generally accepted analytical laboratory principles and practices at the time of performance of services. LAB makes no other warranty, express or implied.

Scope and Compensation. LAB agrees to perform the services described in the chain of custody to which these terms and conditions are attached. Unless the parties agree in writing to the contrary, the duties of LAB shall not be construed to exceed the services specifically described. LAB wi use LAB default method for all tests unless specified otherwise on the Work Order.
Payment terms are net 30 days from the date of invoice. All overdue payments are subject to an interest charge of one and one-half percent (1-1/2%) per month or a portion thereof. Client shall also be responsible for costs of collection, including payment of reasonable attorney fees if such expense is incurred. The prices, unless stated, do not include any sale, use or other taxes. Such taxes will be added to invoice prices when required.

Prices. Compensation for services performed will be based on the current Lab Analytical Fee Schedule or on quotations agreed to in writing by the parties. Turnaround time based charges are determined from the time of resolution of all work order questions. Testimony, court appearances or data compilation for legal action will be charged separately. Evaluation and reporting of initial screening runs may incur additional fees.

Limitations of Liability. In the event of any error, omission, or other professional negligence, the sole and exclusive responsibility of LAB shall be to re-perform the deficient work at its own expense and LAB shall have no other liability whatsoever. All claims shall be deemed waived unless made in writing and received by LAB within ninety (90) days following completion of services.
LAB shall have no liability, obligation, or responsibility of any kind for losses, costs, expenses, or other damages (including but not limited to any special, direct, incidental or consequential damages) with respect to LAB's services or results.
All results provided by LAB are strictly for the use of its clients and LAB is in no way responsible for the use of such results by clients or third parties. All reports should be considered in their entirety, and LAB is not responsible for the separation, detachment, or other use of any portion of these reports. Client may not assign the lab report without the written consent of the LAB.
Client covenants and agrees, at its/his/her sole expense, to indemnify, protect, defend, and save harmless the LAB from and against any and all damages, losses, liabilities, obligations, penalties, claims, litigation, demands, defenses, judgments, suits, actions, proceedings, costs, disbursements and/or expenses (including, without limitation attorneys' and experts' fees and disbursements) of any kind whatsoever which may at any time be imposed upon, incurred by or asserted or awarded against client relating to, resulting from or arising out of (a) the breach of this agreement by this client, (b) the negligence of the client in handling, delivering or disclosing any hazardous substance, (c) the violation of the Client of any applicable law, (d) non-compliance by the Client with any environmental permit or (e) a material misrepresentation in disclosing the materials to be tested.

Hazard Disclosure. Client represents and warrants that any sample delivered to LAB will be preceded or accompanied by complete written disclosure of the presence of any hazardous substances known or suspected by Client. Client further warrants that any sample containing any hazardous substance that is to be delivered to LAB will be packaged, labeled, transported, and delivered properly and in accordance with applicable laws.

Sample Handling. Prior to LAB's acceptance of any sample (or after any revocation of acceptance), the entire risk of loss or of damage to such sample remains with Client. Samples are accepted when receipt is acknowledged on chain of custody documentation. In no event will LAB have any responsibility for the action or inaction of any carrier shipping or delivering any sample to or from LAB premises.
Client authorizes LAB to proceed with the analysis of samples as received by the laboratory, recognizing that any samples not in compliance with all current DOH-ELAP-NELAP requirements for containers, preservation or holding time will be noted as such on th final report.
Disposal of hazardous waste samples is the responsibility of the Client. If the Client does not wish such samples returned, LAB may add storage and disposal fees to the final invoice. Maximum storage time for samples is 30 days after completion of analysis unless modified by applicable state or federal laws. Client will be required to give the LAB written instructions concerning disposal of these samples.
LAB reserves the absolute right, exercisable at any time, to refuse to receive delivery of, refuse to accept, or revoke acceptance of any sample, which, in the sole judgment of LAB (a) is of unsuitable volume, (b) may be or become unsuitable for or may pose a risk in handling, transport, or processing for any health, safety, environmental or other reason whether or not due to the presence in the sample of any hazardous substance, and whether or not such presence has been disclosed to LAB by Client or (c) if the condition or sample date make the sample unsuitable for analysis.

Legal Responsibility. LAB is solely responsible for performance of this contract, and no affiliated company, director, officer, employee, or agent shall have any legal responsibility hereunder, whether in contract or tort including negligence.

Assignment. LAB may assign its performance obligations under this contract to other parties, as it deems necessary. LAB shall disclose to Client any assignee (subcontractor) by ELAP ID # on the submitted final report.

Force Majeure. LAB shall have no responsibility or liability to the Client for any failure or delay in performance by LAB, which results in whole or in part from any cause or circumstance beyond the reasonable control of LAB. Such causes and circumstances shall include, but not limited to, acts of God, acts or orders of any government authority, strikes or other labor disputes, natural disasters, accidents, wars, civil disturbances, difficulties or delays in transportation, mail or delivery services, inability to obtain sufficient services or supplies from LAB's usual suppliers, or any other cause beyond LAB's reasonable control.

Law. This contract shall be continued under the laws of the State of New York without regard to its conflicts of laws provision.

179 Lake Avenue, Rochester, NY 14608 Office (585) 647-2530 Fax (585) 647-3311

1 of 2

CHAIN OF CUSTODY

REPORT TO:		INVOICE TO:		
CLIENT:	Tetra Tech	CLIENT:	Same	LAB PROJECT ID: 260888
ADDRESS:	10 Brown Rd	ADDRESS:		
CITY:	Ithaca STATE: NY ZIP 14850	CITY: STATE: ZIP:		Quotation #:
PHONE:	315.440.7143	PHONE:		Email: tim.thomas2@tetratech.com
ATTN:	Timothy Thomas	ATTN:		

PROJECT REFERENCE

Waverly CSD - Elm St

Matrix Codes:

AQ - Aqueous Liquid; **NQ** - Non-Aqueous Liquid; **WA** - Water; **WG** - Groundwater; **DW** - Drinking Water; **WW** - Wastewater; **SO** - Soil; **SL** - Sludge; **SD** - Solid; **PT** - Paint; **WP** - Wipe; **CK** - Caulk; **OL** - Oil; **AR** - Air

REQUESTED ANALYSIS

DATE COLLECTED	TIME COLLECTED	COMPOSITE	GRAB	SAMPLE IDENTIFIER	MATRIX CODES	NUMBER OF CONTAINERS	PCBs **	RCRA Metals									REMARKS	PARADIGM LAB SAMPLE NUMBER
3/11/2026			X	31126-1 Window Infill Caulk - Hard White/Soft Brown	CK	1	X	X										-01

** All PCBs analysis to have Limit of Detection / Quantitation limit of 5 PPM (mg/Kg) or lower

Turnaround Time		Report Supplements			
Availability contingent upon lab approval; additional fees may apply.					
Standard 5 day	X	None Required		None Required	
10 day		Batch QC		Basic EDD	
Rush 3 day		Category A		NYSDEC EDD	
Rush 2 day		Category B			
Rush 1 day					
Other please indicate date needed:		Other please indicate package needed:		Other EDD please indicate EDD needed:	

Tim Thomas — Sampled By — 3/11/2026 Date/Time

Total Cost:

Relinquished By — Date/Time

Received By — Date/Time 3/13/2026 1035

P.I.F.

Received @ Lab By 21.0°C @ 1034 3/13/2026 Date/Time

By signing this form, client agrees to Paradigm Terms and Conditions (reverse).

Please submit report indicating "Tetra Tech" as the client.

PARADIGM
ENVIRONMENTAL SERVICES

Chain of Custody Supplement

Client: Tetra Tech

Completed by: [signature]

Lab Project ID: 260888

Date: 3/13/2016

Sample Condition Requirements

Per NELAC/ELAP 210/241/242/243/244

Condition	NELAC compliance with the sample condition requirements upon receipt: Yes	No	N/A
Container Type	✓		
Comments			
Transferred to method-compliant container			X
Headspace (<1 mL)			✓
Comments			
Preservation			X
Comments			
Chlorine Absent (<0.10 ppm per test strip)			✓
Comments			
Holding Time	X		
Comments			
Temperature		✓	✓ metals (except Hg)
Comments	21.0°C		
Compliant Sample Quantity/Type	✓		
Comments			

APPENDIX F

Certifications

NEW YORK STATE | Department of Labor

WORKING FOR YOU

DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

ASBESTOS HANDLING LICENSE

Tetra Tech, Inc.
10 Brown Road, Suite 100, Ithaca, NY 14850

License Number: 70436
License Class: RESTRICTED
Date of Issue: 03/10/2026
Expiration Date: 03/31/2027
Duly Authorized Representative: Kevin Terry

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.

Vicki Mockler, Director
For the Commissioner of Labor

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



TIMOTHY THOMAS
CLASS(EXPIRES)
C ATEC (02/27) D INSP (02/27)
I PD (02/27) H PM (02/27)

CERT# 26-6S5L7-SHAB
DMV# 817548740

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 007894936 97

IF FOUND, RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12226

APPENDIX G

Reference Photos



Photo 1 – Receiving Door



Photo 2 – Receiving Door Frame Asbestos and Lead Caulking



Photo 3 – Middle Entryway Window

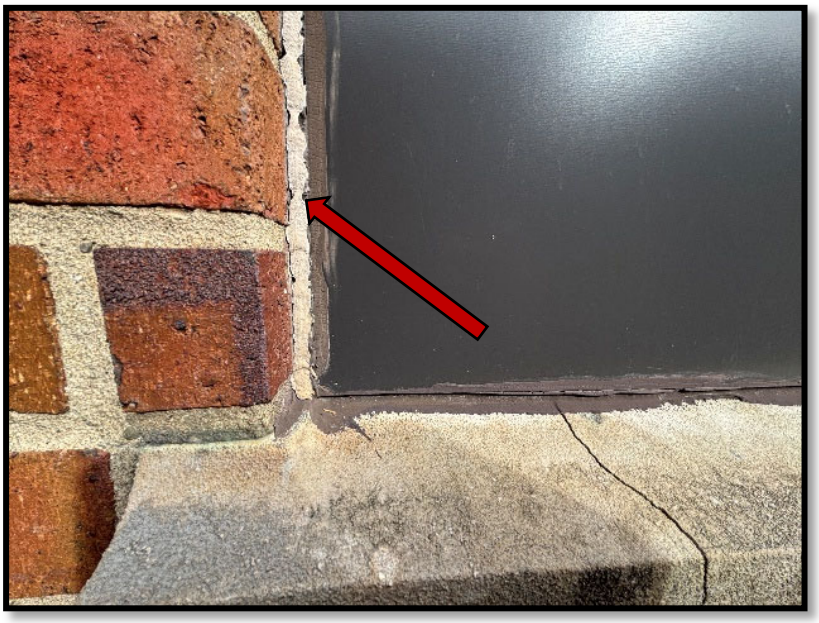


Photo 4 – Middle Entryway Window Caulk



Photo 5 – Library - Asbestos Carpet Tile Mastic - Black

SECTION 02 83 00 – LEAD SAFE WORK PRACTICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lead safe work practices quality assurance requirements including personnel training.
2. Project monitoring and testing services for lead related work, including requirements for sampling and monitoring during lead related activities.
3. Requirements for transport and disposal of lead waste materials by legal and appropriate means.

B. Lead inspections have been performed in accordance with New York State Education Department requirements and a copy of the lead inspection report is available in the Owner's offices for review.

C. All painted and glazed surfaces not identified as Lead-Based Paint shall be treated as lead containing. All contractors shall comply with OSHA requirements for work which disturbs lead containing materials.

1.3 CODES AND REFERENCES

A. The following codes and references apply:

1. New York State Department of Environmental Conservation (DEC):

a. 6 NYCRR 360 - Solid Waste Management Facilities.
b. 6 NYCRR 364 - Waste Transporter Permits.
c. 6 NYCRR 370 - Hazardous Waste Management System: General.
d. 6 NYCRR 371 - Identification and Listing of Hazardous Wastes.
e. 6 NYCRR 372 - Hazardous Waste Manifest and Related Standards for Generators, Transporters and Facilities.
f. 6 NYCRR 373-1 - Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements.
g. 6 NYCRR 373-2 - Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities.
h. 6 NYCRR 373-3 - Interim Status Standards Regulations for Owners and Operators of Hazardous Waste Facilities.
i. 6 NYCRR 376 - Land Disposal Restrictions.

2. Occupational Safety and Health Administration (OSHA) - 29 CFR 1926.62 - Safety and Health Regulations for Construction - Lead.

3. United States Department of Transportation (DOT):

   a. 49 CFR 171 - General Information, Regulations, and Definitions.
   b. 49 CFR 172 - Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
   c. 49 CFR 173 - Shippers - General Requirements for Shipments and Packagings.
   d. 49 CFR 174 - Carriage by Rail.
   e. 49 CFR 175 - Carriage by Aircraft.
   f. 49 CFR 176 - Carriage by Vessel.
   g. 49 CFR 177 - Carriage by Public Highway.
   h. 49 CFR 178 - Specifications for Packagings.
   i. 49 CFR 179 -Specifications for Tank Cars.
   j. 49 CFR 180 -Continuing Qualification and Maintenance of Packagings.

4. United States Environmental Protection Agency (USEPA):

   a. 40 CFR Part 260 - Hazardous Waste Management System: General.
   b. 40 CFR Part 261 - Identification and Listing of Hazardous Waste.
   c. 40 CFR Part 262 - Standards Applicable to Generators of Hazardous Waste.
   d. 40 CFR Part 263 - Standards Applicable to Transporters of Hazardous Waste.
   e. 40 CFR Part 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
   f. 40 CFR Part 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
   g. 40 CFR Part 266 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities.
   h. 40 CFR Part 268 - Land Disposal Restrictions.
   i. 40 CFR Part 270 - EPA Administered Permit Programs: The Hazardous Waste Permit Program.
   j. 40 CFR Part 745, Subpart L - Lead-Based Paint Activities.

5. United States Department of Housing and Urban Development (HUD)

   a. Guidelines for the Evaluation and Control of Lead-Based Paint Hazards In Housing.

B. Failure to expressly refer to applicable code, regulation, standard, law and ordinance within Contract Documents does not imply that applicable regulatory requirements are not applicable to the Project.

1.4 DEFINITIONS

A. Lead-Based Paint: Paint or other surface coatings that contain lead equal to or greater than 1.0 mg/cm2 or 0.5 percent by weight.

B. Lead Containing Materials: Paint or other surface coatings that contain less than 1.0 mg/cm2 or 0.5 percent by weight.

C. Lead Safe Work Practices: Lead safe work practices provide for disturbance of lead, including removal and disposal of lead-based paint; lead containing dust; and lead contaminated soil in accordance with the "HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing", all applicable codes, regulations, standards, laws and ordinances and this Section.

D. Surface Coatings: Paint, shellac, varnish, glaze coat of ceramic tile or block or any other coating including wallpaper that covers painted surfaces.

1.5 ACRONYMS

A. LBP: Lead-Based Paint.

1.6 SUBMITTALS, GENERAL

A. Submit all action submittals and informational submittals (except Employee Training and Certification Documentation) required by this Section concurrently.

1.7 ACTION SUBMITTALS

A. Quality Control Submittals:

1. Valid Waste Transporter Permit, issued by New York State Department of Environmental Conservation.

2. Written communication from designated treatment, storage or disposal facility that it:

a. Is authorized to receive and dispose of waste products generated by this Project.
b. Has capacity to receive and dispose of waste products generated by this Project.
c. Will provide or assure that ultimate disposal method indicated on manifest for particular hazardous waste(s) will be followed.

3. Instruction regarding requirements for distribution of waste manifest as manifest is completed, at time of shipment.

4. Emergency Contact List: List providing means to contact applicable individuals and agencies in event of emergency at any time of day or night and including at least the following individuals and agencies:

a. Contractor Personnel:

1) Project manager.
2) Project supervisor.

b. Sampling Organization: On site sampling technician.

c. Owner.

d. Local police department.

e. Local fire department.

f. Local hospital and ambulance service.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: Employee Training and Certification Documentation: Valid training and certification documentation for new employees prior to employees beginning work.

1.9 CLOSEOUT SUBMITTALS

A. Daily Logs.

B. Sign In Sheets.

C. Laboratory Analysis for clearance sampling.

D. Documentation of Hazardous Waste Determination: Toxicity Characteristic Leachate Procedure sample analysis and documentation that identifies the material(s) sampled.

E. New York State Uniform Hazardous Waste Manifest or manifest as required by the state where the waste is disposed, for waste that is known or determined to be hazardous, and Trip Tickets for all other waste.

1.10 QUALITY ASSURANCE

A. Qualifications:

1. Contractor:

a. Supervision: Full-time, on-site supervisor for each site.

b. Personnel Certification Requirements:

1) Lead-Based Paint Personnel: Maintain current USEPA certification to engage in lead-based paint activities per 40 CFR 745.226.

2) Lead-Based Paint Supervisory Personnel: Maintain current USEPA certification as a lead-based paint abatement supervisor per 40 CFR 745.226.

c. Personnel Training Requirements: In addition to the training requirements for USEPA certification, all lead personnel or lead supervisory personnel, including any personnel entering lead activity areas, shall have training as required by 29 CFR 1926.62.

2. Owner's Sampling/Monitoring Firm: Independent of Contractor and possessing current USEPA certification to perform lead-based paint activities.

    a. Personnel Certification:

        1) Monitoring: Possess current USEPA certification, as per 40 CFR 745, subpart L, as either "Risk Assessor" or "Inspector".

        2) Final Inspection or Clearance Testing: Possess current USEPA certifications, as per 40 CFR 745, subpart L, as either "Risk Assessor" or "Inspector".

3. Lead Analysis Laboratories:

    a. Maintain current National Lead Laboratory Accreditation Program (NLLAP) accreditation.

    b. Maintain current New York State Environmental Laboratory Approval Program (ELAP) accreditation in each method of analysis used.

    c. Use most recent version of specified test method.

    d. Analyze samples for waste characterization using:

        1) Toxicity Characteristic Leachate Procedure - EPA Method 1311.

        2) Analysis by one of following:

            a) Inductively Coupled Plasma-Atomic Emission Spectrometry - EPA Method 6010.
            b) Inductively Coupled Plasma-Mass Spectrometry - EPA Method 6020.
            c) Lead (Atomic Absorption, Direct Aspiration) - EPA Method 7420.
            d) Lead (Atomic Absorption, Furnace Technique) - EPA Method 7421.

    e. Analyze air samples for lead for total lead (if required) using one of following:

        1) Lead by Flame Atomic Absorption Spectrophotometer - NIOSH 7082.
        2) Lead by Graphite Furnace Atomic Absorption Spectrophotometer - NIOSH 7105.
        3) Elements by Inductively Coupled Argon Plasma, Atomic Emission Spectroscopy - NIOSH 7300.

    f. Analyze wipe samples, paint chip samples and soil samples using one of following methods:

        1) Inductively Coupled Plasma-Atomic Emission Spectrometry - EPA Method 6010.
        2) Inductively Coupled Plasma-Mass Spectrometry - EPA Method 6020.
        3) Lead (Atomic Absorption, Direct Aspiration) - EPA Method 7420.
        4) Lead (Atomic Absorption, Furnace Technique) - EPA Method 7421.

B. Regulatory Requirements:

1. Hazardous Waste Generator Status: Owner is “Conditionally Exempt Small Quantity Generator” as defined by 6 NYCRR 371 and 40CFR 260. Schedule removal, on-site storage, and transport as required to maintain Owner’s status as “Conditionally Exempt Small Quantity Generator”.

1.11 PROJECT CONDITIONS

A. Project/Site Access Limitations: Restrict access to all work areas. Immediately report any access by unauthorized individuals to Owner and Project Monitor.

1.12 SEQUENCING AND SCHEDULING

A. Completion: Complete lead hazard control activities in accordance with construction schedule requirements specified in Section 01 12 00 “Multiple Contract Summary-Project Schedule” with each phase considered distinct and separate for purpose of schedule and substantial completion.

1. Substantial Completion of a phase occurs when all of the following occur:

a. All components of the phase have passed visual inspection by Supervisor.
b. Satisfactory clearance criteria are achieved for each portion of the phase.
c. All containment barriers have been removed.
d. Areas are returned to Owner.

2. If Contractor fails to achieve substantial completion within specified schedule requirements, all costs associated with extension of schedule, including (but not limited to) sampling costs, monitoring costs, direct costs incurred by Owner, and costs to accelerate sample analysis shall be deducted from final payment.

B. Restrictions on Working Hours: Schedule work only during regular working hours, as established for Project. Do not use overtime or multiple shifts with "overtime" defined as any time in excess of 8 hours in single day, work on weekends, or work on holidays.

C. Changes in Working Hours: Advise Owner of any changes in hours or days when leas hazard control activities will be conducted on site, at least 24 hours prior to change. Contractor retains all liability resulting from Contractor’s failure to make required notification.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Respirators: Provide respirators jointly approved as acceptable for protection by National Institute for Occupational Safety and Health (NIOSH) under provisions of 30 CFR Part 11.

1. Supply and use respirators in accordance with 29 CFR 1910.134 and 29 CFR1926.62.
2. Provide respirators, filters and ancillary supplies as required for employees and authorized visitors.
3. Account for hazards other than lead in respirator selection.

B. Protective Clothing: Provide disposable protective clothing complying with requirements of 29 CFR 1926.62 that is disposed of after one use. Provide disposable clothing as required for employees and authorized visitors.

C. Lead-Related Construction Facilities and Controls:

1. Polyethylene sheeting (plastic sheeting) - 6-mil thickness, sized to minimize seams.

2. Tape and/or adhesive spray capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

3. Polyethylene waste disposal bags - 6-mil thickness with preprinted labels.

4. HEPA filtered negative pressure equipment.

5. HEPA filtered vacuums.

6. Water filtration, 3 stage with final filtration to at least 5 microns.

7. Barrier tape.

8. Warning signs.

9. Hygiene facilities as required by 29 CFR 1926.62 including showers, cleansing agents and disposable towers.

10. Lead specific detergent, similar to:

a. LSZ, Inc.; Ledizolv.
b. Sentinel Products, Inc.; Sentinel 805.

D. Testing Services Equipment:

1. Wipe Testing:

a. Disposable wipe meeting criteria of ASTM E1792.
b. Non-sterilized non-powdered disposable gloves.
c. Non-sterilized polyethylene centrifuge tubes (50 ml size) or equivalent hard-shell container that can be rinsed quantitatively in laboratory.

2. Air Sampling Cassettes: Commercially available 37 mil cassettes, using mixed cellulose ester sample collection filters with pore size of 0.8 micrometers. Use only new cassettes; reloaded cassettes not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for conditions affecting performance of the Work.
B. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 DE MINIMIS WORK LEVELS

A. De minimis disturbance of lead-based paint is defined as work that does not disturb LBP coated surfaces that total more than:

1. 20 square feet on exterior surfaces;
2. 2 square feet in any one interior room or space; or
3. 10 percent of the total surface area on an interior or exterior type of component with a small surface area. Examples include window sills, baseboards, and trim.

B. Disturbance of lead-based paint that is determined to be at de minimis levels may be performed using the following work methods:

1. None of the "Unacceptable Removal Methods" listed below are used.

2. Work area preparation in full compliance with Level 1 work area preparation.

3. Methods to minimize the creation of dust are used. Methods include, but are not limited to, misting the area to be disturbed, drilling through a wet sponge, using nail fasteners instead of pre-drilling and using screw fasteners.

4. Any generated dust is wet cleaned and appropriately disposed.

5. Clearance sampling consists of a visual inspection by the supervisor to confirm that no dust or debris remains in the area work occurred.

3.3 PROTECTION

A. Provide personal protective equipment as required by 29 CFR 1926.62 at no cost to employees or authorized visitors.

B. Institute respirator program in accordance with 29 CFR 1926.62 and 29 CFR 1910.134 (b), (d), (e) and (f).

C. Use protective clothing and respirators whenever lead is being disturbed, abated, cleaned up, containerized or stored in vehicle or container used to transport waste to landfill.

D. Institute medical surveillance program in accordance with 29 CFR 1926.26 for all employees performing or supervising lead handling work, entering work area containment, or using respirator.

3.4 PREPARATION

A. Prior to all other preparation activities, construct decontamination facilities adjacent to lead work area, consisting of:

1. Dirty area changing room.
2. Shower room.
3. Clean area changing room.
4. Airlock at each entrance and between each room.
5. Floors, walls and ceilings sealed with 2 layers of plastic sheeting.
6. Provision of privacy while using decontamination facilities.

B. Exterior Preparation (Other Than Windows):

1. Seal all openings to interior of building within 20 feet of lead work area, except windows or doors may be closed and locked with two layers of plastic sheeting.

2. Install single layer of plastic sheeting on ground extending 10 feet beyond perimeter of lead work area in all directions. Anchor or tape plastic sheeting to building to avoid gaps between sheeting and building. Secure all plastic to prevent movement; wood studs or similar objects acceptable.

3. Install barrier tape and warning signs at 20-foot perimeter from lead work area.

4. Move all movable objects 20 feet from lead work area.

5. Seal fixed objects and large objects that cannot be moved with a single layer of plastic sheeting.

C. Window Treatment or Removal Preparation:

1. Close all windows within 20 feet of lead activities.

2. Attach single layer of plastic sheeting on ground extending 5 feet beyond perimeter of lead activity in all directions. Anchor or tape plastic sheeting to building to prevent gaps between sheeting and building. Secure all plastic to prevent movement; wood studs or similar objects acceptable.

3. Install barrier tape and warning signs at 20-foot perimeter from lead work area.

4. Where lead activities occur outside structure, seal interior of affected window with two layers of plastic sheeting.

5. Where lead activities occur within structure, provide at least lead work area preparation conforming to Interior Preparation, Level 2, specified below.

6. Move all movable objects 20 feet from lead work area.

7. Seal fixed objects and large objects that cannot be moved with single layer of plastic sheeting.

D. Interior Preparation:

1. Level 1: Dust removal and lead disturbance of no more than 2 square feet of painted surface per room.

    a. Single layer of plastic sheeting on floor extending 5 feet beyond perimeter of treated area in all directions.
    b. Barrier tape and warning signs at all entrances to room.
    c. Ventilation systems turned off and all vents within 5 feet of treated surfaces sealed with plastic sheeting.
    d. Move furniture and movable objects at least 5 feet from treated surfaces.
    e. Seal fixed objects and large objects that cannot be moved with plastic sheeting.
    f. Provide negative pressure equipment where large supplies of fresh air are required to control exposure to other hazardous substances, such as solvent vapors.

2. Level 2: Lead disturbance of 2 square feet to 10 square feet of painted surface per room, where all work in all rooms will be completed in one day.

    a. Apply 2 layers of plastic over entire floor.
    b. Install airlock at entrance to lead work area or room.
    c. Install barrier tape and warning signs at all entrances to room.
    d. Turn off ventilation systems and seal all vents with plastic sheeting.
    e. Move furniture and movable objects from lead work area.
    f. Seal fixed objects and large objects that cannot be moved with a single layer of plastic sheeting.
    g. Provide negative pressure equipment where large supplies of fresh air are required to control exposure to other hazardous substances, such as solvent vapors.

3. Level 3: Lead disturbance of 2 square feet to 10 square feet of painted surface per room, where work in all rooms will be completed in not more than 5 work days.

    a. Apply 2 layers of plastic over entire floor.
    b. Install airlock at entrance to lead work area or room. Airlock not required on doors between adjacent rooms within lead work area.
    c. Post warning signs at entrances to building.
    d. Install barrier tape and warning signs at all entrances to room.
    e. Seal or lock any entrances to room or lead work area not to be used.
    f. Turn off ventilation systems and seal all vents with plastic sheeting.
    g. Move furniture and movable objects from lead work area.
    h. Seal fixed objects and large objects that cannot be moved with a single layer of plastic sheeting.
    i. Provide negative pressure equipment where large supplies of fresh air are required to control exposure to other hazardous substances, such as solvent vapors.

4. Level 4: Lead disturbance of more than 10 square feet of painted surface per room.

    a. Apply 2 layers of plastic over entire floor.
    b. Install airlock at entrance to lead work area or room. Airlock not required on doors between adjacent rooms within lead work area.
    c. Post warning signs at entrances to building.
    d. Install barrier tape and warning signs at all entrances to room.
    e. Seal or lock any entrances to room or lead work area not to be used.
    f. Turn off ventilation systems and seal all vents with plastic sheeting.
    g. Move furniture and movable objects from lead work area.
    h. Seal fixed objects and large objects that cannot be moved with a single layer of plastic sheeting.
    i. Provide negative pressure equipment where large supplies of fresh air are required to control exposure to other hazardous substances, such as solvent vapors.

E. Do not begin lead disturbance or removal activities until all preparation work, including installation of decontamination enclosure systems and any required engineering controls, including negative air pressure equipment, has been completed.

3.5 LEAD WORK PROCEDURES

A. Exterior Lead Work Constraints: Do not proceed with lead activities if wind speeds are greater than 20 miles per hour. Stop lead activities and proceed with cleanup activities before rain begins.

B. Unacceptable Removal Methods:

1. Open flame burning or torching (includes propane-fueled heat grids).
2. Machine sanding or grinding without HEPA local vacuum exhaust tool.
3. Hydroblasting or high-pressure wash.
4. Abrasive blasting or sandblasting without HEPA vacuum exhaust tool.
5. Heat guns operating above 1,100 deg F.
6. Methylene chloride paint removal products.
7. Dry scraping.

C. Acceptable Removal Methods: Since acceptable methods are not appropriate or acceptable for every item or location, refer to Drawings for approved removal methods for individual items and locations.

1. Component Removal:

a. Mist all disturbed paint and dust and maintain in moist condition.
b. Entirely remove indicated components.
c. Wet scrape residual paint from adjacent unpainted surfaces. Do not damage adjacent surfaces.
d. Collect all paint chips, dust and debris and seal in 6 mil plastic bags.
e. Seal removed building components in 6 mil plastic sheeting or 6 mil plastic bags.

2. Heat Gun Removal (operating at less than 1,100 deg F):

a. Provide fire extinguishers in lead work area, and ensure adequate electrical power is available.
b. Use in limited areas only.
c. Do not gouge or abrade substrate.

3. Wet Scraping:

a. Apply adequate water to moisten surface completely; avoid large amounts of water on floor or ground.
b. Do not moisten areas near electrical circuits.
c. Use spray bottles or wet sponge attached to scraper.

4. Offsite Stripping:

a. Apply paint removers in accordance with manufacturer's recommendations.

b. Test paint remover in inconspicuous location approved by Architect to avoid damage to substrate.

c. Identify building component to ensure reinstallation in same location.

d. Mist all paint and dust disturbed and maintain in moist condition.

e. Remove components indicated on Drawings entirely. Wet scrape residual paint from adjacent unpainted surfaces. Do not damage adjacent surfaces.

f. Collect all paint chips, dust and debris and seal in 6 mil plastic bags. Seal removed building components in plastic sheeting. Inform offsite paint remover regarding presence of lead-based paint before shipping;

g. Do not reinstall components until removal of residual paint and cleaning is complete and satisfactory clearance sampling achieved.

5. Onsite Stripping:

a. Apply paint removers in accordance with manufacturer's recommendations.
b. Test paint remover in inconspicuous location approved by Architect to avoid damage to substrate.
c. Do not damage adjacent surfaces.
d. Collect all paint chips, dust and debris and seal in 6 mil plastic bags.

D. Work Stoppage Criteria During Lead Activities:

1. During lead related activities, stop work immediately if damaged containment barriers are discovered or if dust or paint chips are discovered outside of lead work area.
2. Prior to resumption of lead activities, perform cleanup of areas adjacent to lead work area using HEPA vacuums or wet cleaning methods.

E. Clean Up Procedures:

1. Exterior:

a. At end of each day, whether or not lead related activities are complete, clean up and store all removed components, debris, and plastic sheeting drop cloths in lockable containers with solid floors, walls and ceilings until transported off site.

b. HEPA vacuum and wash all plastic sheeting with lead specific detergent.

c. Place all plastic sheeting used to cover ground and seal openings to interior of building in containers.

2. Interior:

a. Conduct ongoing cleaning during lead related activities, including regular removal of large and small debris.

b. Clean up visible debris and components prior to leaving lead work site at end of work shift.

c. Decontaminate all tools, equipment, and worker protection gear before removing from contaminated areas.

d. Wait at least 1 hour after active lead removal or disturbance has ceased before final cleaning.

e. Final cleaning includes HEPA vacuum, wet wash, and HEPA vacuum cycle:

1) HEPA vacuum all surfaces in room (ceilings, walls, trim, and floors), starting with ceiling and working down, moving toward entry door. Completely clean each room before beginning clean up in another room.

2) Wash all surfaces with lead-specific detergent, changing cleaning solution after completing cleaning in every room.

3) Repeat HEPA vacuuming of all surfaces in room (ceilings, walls, trim, and floors), starting with ceiling and working down, moving toward entry door. Completely clean each room before clean up in another room.

f. After completing all disturbance, removal and cleaning activities, and completion of the 1 hour waiting period, provide access to areas for Owner's monitoring firm to perform visual examination to ensure that all removal has been completed and all visible dust and debris have been removed. Correct all incomplete lead work prior to clearance sampling.

F. Clearance Monitoring: After supervisor and monitor have performed visual inspection and have provisionally determined that removal and cleaning have been properly completed, monitor begins clearance monitoring. Removal and cleaning not properly completed until lead work area achieves satisfactory clearance sampling in accordance with this Section.

G. Removal of Work Area Containment:

1. Do not remove remaining plastic sheeting, barriers, decontamination facilities, negative pressure equipment and ancillary items until satisfactory clearance air monitoring results are achieved.

2. Notify Owner immediately if any residual lead debris is identified during removal of plastic sheeting, barriers, decontamination facilities, negative pressure equipment and ancillary items, and clean up debris.

3. Clean all tape, glue, staples, etc. used in lead work process.

4. Repair damage to walls, floors, ceilings, fixtures, or other items not scheduled for demolition or lead work to pre-lead work condition. Where finishes are damaged, refinish or repaint entire object or to nearest break in surface of walls, ceilings, soffits, etc.

5. Remove entire containment when partial occupancy by Owner is required before Owner occupies area or other entities occupy space for additional construction as required.

6. Paint or otherwise seal treated surfaces not scheduled for painting.

3.6 WASTE SEGREGATION AND CHARACTERIZATION

A. Segregate waste in following categories:

1. Removed components (considered construction and demolition debris for bidding purposes).

2. Paint chips, dust and filters from HEPA vacuums (considered hazardous waste for bidding purposes).

3. Respirator filter cartridges, rags, sponges, mops, scrapers and other materials used for testing lead work, and clean-up (considered construction and demolition debris for bidding purposes).

4. Contaminated soil (considered hazardous waste for bidding purposes).

5. Cleaned plastic sheeting and disposable work clothes (considered construction and demolition debris for bidding purposes).

B. Sample each container of waste to determine if it is characterized as hazardous waste, treating each sample as follows:

1. Prepare using Toxicity Characteristic Leachate Procedure, EPA method 1311.
2. Analyze for lead using EPA method 6010, 6020, 7420 or 7421.
3. Analyze for any other hazardous characteristic introduced into waste by lead procedures.

C. Consider cleaned plastic sheeting and disposable work clothes not sufficiently cleaned as hazardous waste and dispose as hazardous waste at no additional cost to Owner.

D. Maintain each waste category above in separate hard-walled lockable containers until waste characterization is complete. If waste is mixed from different categories, dispose all mixed waste as hazardous waste at no additional cost to Owner.

3.7 FIELD QUALITY CONTROL

A. Inspection of Barriers: Provide inspection of all barriers at least twice daily by Contractor's Supervisor and record inspections and observations in daily project log.

B. Repairs to Barriers and/or Enclosure Systems: Repair damage and defects in barriers and enclosure systems immediately upon discovery and prior to resumption of lead activities.

C. Testing By Owner: Owner reserves right to obtain independent monitoring and sampling services to provide independent documentation regarding compliance with regulatory requirements. Where Owner provides monitoring, sampling (or both), use most stringent results from inspections, daily air sampling and clearance sampling.

D. Contractor Requirements:

1. Provide air sampling as required by 29 CFR 1926.62.

2. Provide sampling and analysis for waste characterization.

3. Provide access to lead work areas for Owner's Monitor/Sampling Technician to observe all lead related work and collect samples.

4. Provide adequate lighting, ladders, scaffolding, and similar items to enable Monitor/Sampling Technician to perform visual inspections of all surfaces within lead work areas.

5. Provide sufficient temporary electrical power to locations within lead work areas as required to supply high volume air sampling pumps for daily and clearance air samples.

6. Do not perform any monitoring functions with Contractor's personnel or with firms wholly or partly owned by Contractor. Notify Owner and Architect immediately of any conflict of interest between Contractor and any firm providing monitoring, sampling or laboratory analysis.

7. Contractor retains complete and total responsibility for complying with Contract Documents and all regulatory requirements.

E. Area Air Sampling Procedures (if used): Comply with provisions of NIOSH 7082.

F. Clearance Sampling Procedures:

1. Timing of Clearance Sampling: Do not begin clearance sampling until:

   a. All lead related work and cleaning work has ceased.
   b. All personnel have left lead work area.
   c. Minimum 1 hour settling period has elapsed.

2. Exterior Work Area Clearance:

   a. Background Sampling:

      1) Background sampling is optional and for informational purposes only. If elected to be performed, determine required clearance sampling strategy.
      2) Collect representative samples of same number and kind as required for clearance.
      3) Hold samples until after lead disturbance, removal, cleaning, clearance sampling and sample analysis is complete.
      4) If any sample results are above clearance criteria, analyze background samples for comparison with clearance sample results.
      5) Background sampling intended for informational purposes only and does not relieve the contractor from meeting below clearance criteria.

b. Clearance Wipe Sampling:

1) Collect minimum of 1 sample from horizontal surfaces in immediate area of lead work on each side of building where lead work occurs.

2) Collect minimum of 1 window trough sample on each floor and each side of building where lead work occurs.

3) If applicable, collect minimum of 1 additional window trough sample on floor below lead work for each side of building where lead work occurs.

4) Refer to U.S. Department of Housing and Urban Development Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, Appendix 13.1: Wipe Sampling for Settled Lead-Contaminated Dust for sampling requirements.

5) Use the Lead Hazard Control Clearance Dust Sampling Form (Single Surface Sampling) Form 15.2, from U.S. Department of Housing and Urban Development Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing to document following:

a) Sample locations.
b) Surface area sampled.
c) Project information.
d) Chain of custody information.
e) Signatures.

6) Clearance Level: 400 μg/sq ft.

c. Clearance Soil Sampling:

1) Clearance wipe sampling consists of composite samples, consisting of 2 to 4 component samples.

2) Collect 1 composite sample from each side of building on which lead work occurs.

3) Refer to U.S. Department of Housing and Urban Development Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, Appendix 13.3: Soil Sampling Protocol For Housing for sampling requirements.

4) Use Lead Hazard Control Clearance Soil Sampling Form (Composite Sampling Only) Form 15.3, from U.S. Department of Housing and Urban Development Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing to document following:

a) Sample locations.
b) Surface area sampled.
c) Project information.
d) Chain of custody information.
e) Signatures.

5) Clearance Level: 400 μg/g.

3. Interior Work Area Clearance:

a. Background Sampling:

1) Background sampling is optional and for informational purposes only. If elected to be performed, determine required clearance sampling strategy.
2) Collect representative samples of same number and kind as required for clearance.
3) Hold samples until after lead disturbance, removal, cleaning, clearance sampling and sample analysis is complete.
4) If any of sample results are above clearance criteria, analyze background samples for comparison with clearance sample results.
5) Background sampling intended for informational purposes only and does not relieve the contractor from meeting below clearance criteria.

b. Clearance Wipe Sampling:

1) Collect minimum 2 dust samples from at least 4 rooms. If lead work occurs in less than 4 rooms, collect samples where no lead work occurred.

2) Collect 1 floor sample in each room where lead work occurred.

3) Collect 1 interior windowsill or window trough per room where lead work occurred, alternating between rooms.

4) For 20 percent of rooms where lead work occurs, collect 1 floor sample outside of room in uncontaminated space, but within 10 feet of airlock.

5) For each room over 2,000 square feet, collect 1 additional floor sample for every 2,000 square feet and collect 1 floor sample outside of room in uncontaminated space, but within 10 feet of airlock.

6) Refer to U.S. Department of Housing and Urban Development Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, Appendix 13.1: Wipe Sampling for Settled Lead-Contaminated Dust for sampling requirements.

7) Use Lead Hazard Control Clearance Dust Sampling Form (Single Surface Sampling) Form 15.2, from U.S. Department of Housing and Urban Development Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing to document following:

a) Sample locations.
b) Surface area sampled.
c) Project information.
d) Chain of custody information.
e) Signatures.

8) Satisfactory Clearance Level:

a) Bare and Carpeted Floors: 10 µg/sq ft.
b) Interior Window Sills: 100 µg/ sq ft.
c) Window Troughs: 400 µg/sq ft.

G. Failure of Clearance Sampling:

1. Clearance criteria achieved when:

a. All scheduled lead removal is complete.
b. No dust or debris remains within lead work area.
c. Clearance sample results are below clearance level or background whichever is greater.

2. Re-clean any lead work area or other area not meeting clearance criteria.

3. Where clearance criteria are not met for soil, remove 2 inches of soil from perimeter of 20 feet around building, or portion thereof, where lead was removed or wherever paint chips are found, whichever is greater.

4. Sampling technician collects new samples in approximately same locations for each lead work area with samples not meeting clearance criteria.

5. Repeat cleaning, sampling, monitoring, and analysis until satisfactory clearance criteria are achieved.

6. Failure of clearance monitoring indicates lead activity has not been properly completed; Contractor performs additional cleaning at no additional cost to Owner, including sampling and sample analysis during additional cleaning and clearance sampling. Contractor remains responsible for complying with all specified schedules and timing.

3.8 PACKAGING, TRANSPORTATION AND WASTE DISPOSAL

A. Perform additional surveys as hazardous material disposal progresses to detect hazards resulting from hazardous material disposal activities.

B. Use hazardous waste characterization performed in accordance with "Waste Segregation and Characterization" Article above to document and confirm classification of waste. Prior to removing waste from site, confirm in writing to Owner:

1. Results of waste characterization testing.
2. Identification of waste documented to have waste classification identified in "Waste Segregation and Characterization".
3. Identification of waste characterization varying from "Waste Segregation and Characterization".

C. Packaging: Package, label, and mark all hazardous waste materials in accordance with applicable requirements of 49 CFR 173, 178 and 179.

D. Temporary On-Site Storage and Protection: Provide storage on site of hazardous materials removed from service and scheduled for disposal complying with requirements of 6 NYCRR 372.2 (a) (8). Do not exceed 180 days storage on site.

E. Hazardous Waste Determination: Provide analysis required by treatment, storage or disposal facility to document hazardous waste determination.

F. Hazardous Waste Manifests:

1. Maintain manifest from date of transport until date of disposal, destruction or recycling.

2. Return fully executed manifests to Owner within 60 days of date waste accepted by initial transporter.

3. Use following type of manifest as applicable:

   a. If waste disposed of in New York State or if waste disposed in state not requiring use of specific manifest form, use New York State Uniform Hazardous Waste Manifest.

   b. If waste disposed of in state other than New York State and use of specific manifest form is required, use manifest required by state where waste is disposed in lieu of New York State Uniform Hazardous Waste Manifest.

4. Complete manifest and deliver to Owner for review and signature.

5. Retain copies of manifest required to remain with hazardous waste shipment and deliver remaining copies to Owner.

6. Advise Owner regarding required distribution of manifest, both verbally and in writing.

G. Disposal: Transport hazardous waste to treatment or disposal facility complying with following requirements:

1. Permitted, licensed or registered by state to dispose of hazardous waste.
2. Possesses interim status to dispose of hazardous waste.
3. Authorized to manage hazardous waste under Resource Conservation and Recovery Act (RCRA).
4. Beneficially uses/re-uses or legitimately recycles/reclaims waste; or treats waste prior to beneficial use/reuse or legitimate recycling/reclamation.

H. Construction and Demolition Debris: Dispose of material determined to be construction and demolition debris as such in accordance with 6 NYCRR 360 and 364. Provide trip tickets or other documentation clearly identifying amount of material removed from site, transported to disposal site and disposed of, including at least:

1. Name, address and telephone of waste generator.
2. Approximate quantity.
3. Name and telephone of disposal site operator.
4. Name and physical site location of disposal site.
5. Name, address and telephone number of transporter.

END OF SECTION 02 83 00

SECTION 02 84 00 – HAZARDOUS MATERIAL REMOVAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Selective removal and subsequent off-site disposal of the following hazardous waste:

a. Caulk containing heavy metals, characterized as hazardous waste in accordance with RCRA 40 CFR 260-265, based on total metals analysis. The below caulking materials contain the following heavy metals (total metal analysis result):

1) Window Frame / Sill Caulk - Black – Lead (593 ppm)
2) Overhead Door Frame Caulk – Old/Cracked White – Lead (32,000 ppm)

1.3 REFERENCES

A. Regulatory Requirements

1. National Institute For Occupational Safety And Health (NIOSH)

a. NIOSH 94-113 (1994; 4TH Ed) –NIOSH Manual of Analytical Methods.
b. 42 CFR 84 –Approval of Respiratory Protection Devices.

2. New York State Department of Environmental Conservation (NYSDEC)

a. 6 NYCRR 360 - Solid Waste Management Facilities.
b. 6 NYCRR 364 - Waste Transporter Permits.
c. 6 NYCRR 370 - Hazardous Waste Management System: General.
d. 6 NYCRR 371 - Identification and Listing of Hazardous Wastes.
e. 6 NYCRR 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities.
f. 6 NYCRR 373-1 - Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements.
g. 6 NYCRR 373-2 - Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities.
h. 6 NYCRR 373-3 - Interim Status Standards for Owners and Operators of Hazardous Waste Facilities.
i. 6 NYCRR 376 - Land Disposal Restrictions.

3. United States Department Of Labor –Occupational Safety And Health Administration (OSHA)

    a. 29 CFR 1910.134 –Respiratory Protection.
    b. 29 CFR 1910.141 –Sanitation.
    c. 29 CFR 1910.147 –Control of Hazardous Energy (Lock Out / Tag Out).
    d. 29 CFR 1926 –Safety and Health Regulations for Construction.

4. United States Department of Transportation (USDOT)

    a. 49 CFR 107 – Hazardous Materials Program Procedures.
    b. 49 CFR 171 - General Information, Regulations, and Definitions.
    c. 49 CFR 172 - Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
    d. 49 CFR 173 - Shippers - General Requirements for Shipments and Packaging.
    e. 49 CFR 177 - Carriage by Public Highway.
    f. 49 CFR 178 - Specifications for Packaging.
    g. 49 CFR 180 - Continuing Qualification for Maintenance of Packaging.

5. United States Environmental Protection Agency (EPA), Resource Conservation and Recovery Act (RCRA)

    a. 40 CFR 26 – Protection of Human Subjects.
    b. 40 CFR 260 Hazardous Waste Management System: General.
    c. 40 CFR 261 - Identification and Listing of Hazardous Waste.
    d. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste.
    e. 40 CFR 263 Standards Applicable to Transporters of Hazardous Waste.
    f. 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
    g. 40 CFR 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
    h. 40 CFR 266 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities.
    i. 40 CFR 268 Land Disposal Restrictions.
    j. 40 CFR 270 EPA Administered Permit Programs: The Hazardous Waste Permit Program.
    k. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions.

6. United States Department of Transportation (USDOT)

    a. 49 CFR 107 – Hazardous Materials Program Procedures.
    b. 49 CFR 171 - General Information, Regulations, and Definitions.
    c. 49 CFR 172 - Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
    d. 49 CFR 173 - Shippers - General Requirements for Shipments and Packaging.
    e. 49 CFR 177 - Carriage by Public Highway.
    f. 49 CFR 178 - Specifications for Packaging.
    g. 49 CFR 180 - Continuing Qualification for Maintenance of Packaging.

1.4 HAZARDOUS WASTE GENERATOR STATUS

A. Owner is a Very Small Quantity Generator as defined by 6 NYCRR 371 and 40 CFR 26. Schedule removals, on-site storage, and transport as required to maintain Owner's status as a Very Small Quantity Generator.

1.5 DEFINITIONS

A. Critical barriers: Barriers that seal off all openings to or within the defined regulated work area, including but not limited to operable windows and skylights, doorways, ducts, grills, diffusers and any other penetrations to surfaces adjacent to or within the regulated work area.

B. Leak-tight: Sealed such that solids or liquids cannot escape or spill out.

C. Plasticize To cover floors, walls, ceilings or other surfaces with 6-mil fire-retardant plastic sheeting.

D. Regulated Work Area: The portion of the restricted area where removal work actually occurs. For tent work areas, the interior of each tent is a regulated work area.

E. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain Owner's property.

F. Submit all submittals required by this Section concurrently.

1.6 PRE-REMOVAL SUBMITTALS

A. Submit all submittals required by this Section concurrently.

B. Product Data: For each type of product indicated.

1. Encapsulants.

C. Material Safety Data Sheets: For all chemicals to be used.

D. Shop Drawings: Floor or site plans showing all regulated work areas, critical barriers, local exhaust systems locations, decontamination units and load-out units, temporary waste storage facility, access tunnels, and location of temporary utilities.

E. Hazardous Material Removal Plan: Description of proposed methods of removing, packaging, handling, transporting, and disposing of PCB, lead, and mercury containing wastes, and demonstrating compliance with RCRA 40 CFR 260-265, TSCA 40 CFR 761, NYS DEC regulations, and other applicable laws and regulations. The Plan shall include descriptions and means of compliance for each waste stream.

F. Qualification Data: In accordance with "Quality Assurance" article below.

1. Waste Transporter permit.
2. Disposal facility qualifications.

1.7 POST-REMOVAL SUBMITTALS

A. Submit all submittals required by this Section concurrently.

B. Daily Logs

C. Sign In Sheets

D. Results of bulk sample analysis, air samples analysis, or OSHA compliance monitoring results.

E. Completely executed Waste Shipment Records.

F. Documentation of Hazardous Waste Determination, consisting of:

1. Test results;
2. Waste analyses or
3. Other hazardous waste determination information.

1.8 QUALITY ASSURANCE

A. Qualifications

1. Hazardous Material Removal Contractor: Engage experienced firm that has successfully completed at least five hazardous material removal projects of a similar size and scope to Project.

2. Personnel Training Requirements:

   a. Supervisor: Current OSHA HAZWOPER Supervisor training (29 CFR 1910.120), RCRA Hazardous Waste training, and USDOT Hazardous Material training (49 CFR 172), and be the Contractor's designated Competent Person under OSHA regulations. Contractor may only perform work on site when Supervisor is physically on site.

   b. Workers: Current OSHA HAZWOPER training (29 CFR 1910.120), RCRA Hazardous Waste training, and USDOT Hazardous Material training (49 CFR 172).

   c. Provide Project Monitor with copies of valid Training Documentation for all Workers and Supervisors at the project site.

3. Waste Transporter: Valid Waste Transporter Permit, issued by New York State Department of Environmental Conservation. The transporters shall meet the NYSDEC requirements of 6 NYCRR 364 and other applicable state or local requirements.

4. Disposal Facility: Contractor shall provide written evidence that the landfill to be used is approved to accept the hazardous materials removed by New York State. The disposal facility shall be approved to accept the hazardous materials for disposal under RCRA and/or TSCA and other applicable state or local requirements.

B. Regulatory Requirements: Comply with all federal, state, and local codes, laws, ordinances, standards and regulations applicable to hazardous material removal work, transport and disposal, including (but not limited to) standards referenced in "References" Article.

C. Pre-Removal Conference - Prior to beginning hazardous material removal, conduct conference at Site to review requirements and conditions for hazardous material removal with attendance by at least the following:

1. Contractor's representative.
2. Hazardous material removal contractor representative, if applicable.
3. Owner's representative.
4. Architect’s representative.

1.9 PROJECT/SITE CONDITIONS

A. Existing Conditions

1. Building Occupancy: Owner will occupy portions of building immediately adjacent to areas of hazardous material removal operations. Conduct removal operations in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of removal activities that will affect Owner's normal operations.

2. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during hazardous material removal operations.

a. Do not interrupt utilities service occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

b. Maintain fire protection services during removal operations.

B. Onsite Project Documentation

1. Contractor shall maintain all required documents on site. Documents shall be available for review by the Owner, Architect, Monitoring Firm, regulatory agencies and Owner representatives.

2. Supervisor shall maintain a log book containing pertinent information about the project.

3. Maintain a sign in of all individuals entering regulated areas.

C. Regulated Work Areas

1. All work that may impact hazardous materials shall be conducted within regulated areas. The regulated area shall be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to hazardous materials. Access to regulated areas shall be limited to authorized persons. The Contractor shall control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

PART 2 - PRODUCTS

2.1 ENCAPSULANTS

A. Encapsulants shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvents. Provide a two part, 100% solids, moisture-tolerant epoxy resin encapsulant, similar to Sikagard 62.

1. Tensile properties (astm d-638) - 14 day

a. Tensile strength –5,400 psi;
b. Elongation at break 2.7%
c. Abrasion (astm d-1044) (taber abrader) –7 day: Weight loss, 1,000 cycles (h-22 wheel, 1,000 gm weight) –0.61 gm
d. Abrasion resistance (astm d-968) –14 day: Abrasion coefficient 51 liters/mil
e. Adhesion (astm d-3359) –1 day: Adhesion classification 4a
f. Water absorption (astm d-570) –7 day: 24 hour immersion –0.1%

2.2 PERSONAL PROTECTIVE EQUIPMENT

A. Complete sets of personal protective equipment shall be made available to authorized visitors for entry to the regulated area. Authorized visitors shall have training equivalent to that provided to Contractor employees in the selection, fitting, and use of personal protective equipment and the site safety and health requirements. Contractor workers shall be provided with personal protective clothing and equipment and the Contractor shall ensure that it is worn properly. The Contractor's Supervisor shall select and approve all the required personal protective clothing and equipment.

B. Respirators: The Contractor shall provide respirators, and ensure that they are used in accordance with CGA G-7 and the manufacturer's recommendations. Respirators shall be approved by the National Institute for Occupational Safety and Health NIOSH, under the provisions of 42 CFR 84, for use in environments containing particulate. For air-purifying respirators, the particulate filter shall be high-efficiency particulate air (HEPA)/(N-,R-,P-100).

C. Coveralls: Disposable coveralls with a zipper front shall be provided. Sleeves shall be secured at the wrists, and foot coverings secured at the ankles.

D. Gloves: Gloves shall be provided to protect the hands where there is the potential for hand injuries (i.e., scrapes, punctures, cuts, etc.).

E. Foot Coverings: Cloth socks shall be provided and worn next to the skin. Footwear, as required by OSHA and EM 385-1-1, that is appropriate for safety and health hazards in the area shall be worn. Reusable footwear removed from the regulated area shall be thoroughly decontaminated or disposed of as hazardous material waste.

F. Head Covering: Hood type disposable head covering shall be provided. In addition, protective head gear (hard hats) shall be provided as required. Hard hats shall only be removed from the regulated area after being thoroughly decontaminated.

G. Protective Eye Wear: Eye protection shall be provided, when operations present a potential eye injury hazard, and shall meet the requirements of ANSI Z87.1.

2.3 DECONTAMINATION FACILITIES AND PRACTICES

A. The Contractor shall establish a decontamination area for the decontamination of employees, material and equipment. The Contractor shall ensure that employees enter and exit the regulated area through the decontamination area.

B. Decontamination Facility Construction

1. A minimum of one layer of six mil fire-retardant plastic sheeting shall be installed on walls and ceilings.

2. A minimum of two layers of six mil fire-retardant reinforced plastic shall be used for floor protection.

3. Curtained doorways consisting of three layers of six mil fire-retardant plastic sheeting shall separate the stages of the decontamination systems.

4. Airlocks shall have minimum dimensions of three feet wide by three feet long by 6 feet tall. Curtained doorways shall be separated by at least three feet.

5. Provide at least one shower per every six full shift removal workers. Hot and cold water shall be adjustable at each shower. Provide soap, shampoo and towels for use at all times. Shower water shall be filtered through a series of filters to at least 5.0 microns. Filtered wastewater shall be discharged in accordance with applicable codes.

6. The entrance to the clean room or holding area from outside the regulated removal work area shall have a lockable door.

7. Prefabricated or Trailer units may be constructed of watertight fiberglass or painted with marine paint in lieu of plasticization.

8. Personal decontamination facility minimum requirements:

   a. Five stage (large work area) personal decontamination enclosure shall consist of a clean room, airlock, shower room, airlock, and equipment room with a curtained doorway between the clean room and work area.

   b. Three stage (Small work area) personal decontamination enclosure shall consist of a clean room, shower room and equipment room with a curtained doorway between each room and between the clean room and work area.

   c. Where remote decontamination facilities are allowed, construction of the decontamination facility shall include an additional airlock after the equipment room and which shall include a lockable door. An additional airlock is required at the entrance to the containment / regulated area and shall include a lockable door.

9. Waste decontamination facility minimum requirements

   a. Three stage (large work area) waste decontamination facility shall consist of a holding area, airlock washroom with a curtained doorway between the washroom and work area.

   b. Decontamination area shall consist of a room or area that is adjacent to the work area with the floor or horizontal work surface covered with an impermeable drop cloth.

   c. Small work areas with only one entrance my use the personal decontamination facility for waste decontamination.

      1) Where remote decontamination facilities are allowed a small and large work areas shall have a washroom constructed between the work area and airlock.

2.4 LOCAL EXHAUST SYSTEM

A. Local exhaust units shall conform to ANSI Z9.2. Filters on local exhaust system equipment shall conform to ANSI Z9.2 and UL 586. Filter shall be UL labeled.

2.5 EQUIPMENT

A. Vacuums shall be equipped with HEPA filters, of sufficient capacity and necessary capture velocity at the nozzle or nozzle attachment to efficiently collect, transport and retain the hazardous waste material.

B. Power tools shall not be used to remove Hazardous materials unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation capture and collection system.

C. Reusable tools shall be thoroughly decontaminated prior to being removed from regulated areas.

D. Hazardous Waste Disposal Vehicles: Provide vehicles for transporting hazardous waste possessing valid Waste Transporter Permit as prescribed by 6 NYCRR 364, and equipped with appropriate placards affixed as prescribed by United States Department of Transportation regulations.

2.6 MISCELLANEOUS MATERIALS

A. Duct Tape: Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container.

B. Sheet Plastic:

1. Polyethylene of 6 mil minimum thickness and shall be provided in the largest sheet size necessary to minimize seams. Film shall conform to ASTM D 4397, except as specified below.

2. Flame Resistant: Film shall conform to the requirements of NFPA 701.

3. Reinforced sheets shall be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.

C. Warning Signs and Tape: Warning signs and tape printed in English shall be provided at the regulated boundaries and entrances to regulated areas. Signs shall be located to allow personnel to read the signs and take the necessary protective steps required before entering the area.

D. Labeling and Packaging Materials: Provide labeling and packaging materials as required by 49 CFR 173 Shippers - General Requirements for Shipments and Packaging.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Hazardous material removal work tasks shall be performed as shown on the detailed plans and drawings and as per applicable regulations, including but not limited to, 29 CFR 1926, 40 CFR 266, and 40 CFR 761. Where work methods described within differ from applicable regulations the more stringent requirement shall apply.

B. Personnel shall wear and utilize protective clothing and equipment.

C. The Contractor shall not permit eating, smoking, drinking, chewing or applying cosmetics in the regulated area.

D. Verification of Conditions (by Removal Contractor): Examine conditions under which hazardous material removal is to be conducted in coordination with removal contractor and notify affected Contractors and Architect in writing of any conditions detrimental to proper and timely hazardous material disposal. Do not proceed with disposal until unsatisfactory conditions have been corrected in manner acceptable to removal contractor.

1. When removal contractor confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to removal contractor.

2. Survey existing conditions and coordinate with hazardous material removal requirements indicated to determine extent of hazardous material removal required.

3. Inventory and record condition of items to be removed and reinstalled and items to be removed and salvaged.

4. Survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during hazardous material removal operations.

E. Perform additional surveys as hazardous material removal progresses to detect hazards resulting from hazardous material removal activities.

3.2 WORK AREA PREPARATION

A. Work Area Layout and Emergency Exiting: Emergency and fire exits from the regulated removal work area shall be maintained or alternate exits shall be established and appropriately signed according to all applicable codes. Temporary hardwall barriers are not required at emergency and fire exit locations.

B. Protection of Adjacent Work or Areas to Remain: Hazardous materials removal shall be performed without damage to or contamination of adjacent work or area. Where such work or area is damaged or contaminated, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Owner. If a spill occurs, work shall stop in all affected areas immediately and the spill shall be cleaned.

C. Establishing Each Regulated Work Area: Work area preparation shall not begin until Contractor has ensured: that the area has been vacated by all personnel; entry has been restricted to the removal contractor and authorized visitors; and required signage has been posted.

D. Decontamination Facilities: Personal decontamination facilities shall be provided and functional prior to beginning other work area preparation.

E. Electrical Power:

1. Shutdown and lockout all electrical power to the work area.

2. Extend and route temporary power from outside the work area. All temporary power shall be protected by a ground fault circuit interrupter (GFCI).

3. Electrical power that runs through the work area, but does not service the work area and cannot be shutdown, may be sealed with three independent layers of plastic sheeting and labeled with a minimum two inch lettering which reads "DANGER LIVE ELECTRICAL–KEEP CLEAR". Signage shall be posted intervals no greater than ten feet.

F. HVAC Systems: Shut down and isolate HVAC equipment from the regulated work area.

G. Pre-Cleaning:

1. Movable objects

a. HEPA vacuum and/or wet clean remaining movable objects and remove from the area
b. Carpeting to be left in place shall be covered with 3/8 inch thick plywood sheathing prior to plasticization.

2. Fixed Objects: HEPA vacuum and/or wet clean fixed or other objects to remain in the work area and seal with two layers of plastic sheeting

H. Barrier Locations: HEPA vacuum and wet all locations where critical and isolation barriers are to be installed prior to installation negative pressure equipment or barriers.

3.3 WORK AREA ENCLOSURE

A. Exterior Work Areas:

1. The regulated removal work area shall include the immediate work area where work is occurring and shall extend twenty-five feet from the perimeter of the immediate work area.

2. If entrance and egress to the regulated work area is through the building interior (such as through an internal stairway) construct an airlock at the entrance.

3. Critical barriers

a. Pre-clean affected areas

b. Seal all openings in the regulated removal work area with at least two layers of plastic sheeting.

c. Where an entrance to the building that cannot be sealed (either for primary or emergency entrance for vehicles or people) exists within one floor level above or below and within 25 feet of the perimeter of the regulated removal work area, a tunnel structure with walls and ceilings covered with plywood and sealed with two layers of plastic sheeting must extend 25 feet from the building.

d. Hardwall isolation barriers are not required.

e. Sealing floors, walls and ceilings with two layers of plastic sheeting is not required.

f. For removal from the face of the building, including windows.

1) Where work is not performed in tents, seal all openings to the building within a 25 foot perimeter of the regulated removal work area with two layers of plastic sheeting.

2) Where removal work will expose an opening to the building (such as windows, doors, panels) seal the removal area from the inside with two layers of plastic sheeting.

3) Where work is not performed within tents, a dropcloth of plastic sheeting shall be installed below areas of removal that shall be a minimum of ten feet wide with an additional ten feet wide for every floor above the first floor to a maximum of thirty feet.

4) Scaffolding, manlifts, etc. Shall be plasticized with two layers of plastic sheeting.

3.4 WORK PROCEDURES

A. Stop Work:

1. Immediately stop work and take corrective action if any of the following occurs:

a. Visible emissions are observed outside the work area.
b. Water leaks are observed outside the work area.
c. Loss of integrity of an enclosure of any type.
d. A stop work directive is issued by the Project Monitor.

2. Corrective action shall include repair of enclosure barriers, removal of all released material and cleaning / removal of materials / surfaces contaminated by the release and restoration of such materials / surfaces.

3. Project Monitor Stop Work Directive:

   a. Monitoring Firm shall have to the prerogative and responsibility to direct the removal contractor to stop work when they believe that a release has occurred or is imminent.

   b. Monitoring Firm shall notify the removal contractor , Owner, Architect , and Construction Manager of the stop work directive at least verbally as soon as is practicable. Verbal notification shall be followed by written notification within twenty four hours. Written notification may be in electronic format.

4. Upon receipt of a verbal or written stop work directive, removal contractor shall immediately cease all new disturbance of hazardous materials and begin:

   a. Isolating and sealing areas of disturbed hazardous materials from areas outside of regulated areas or contaminated areas;
   b. Repairing containment barriers; and
   c. Cleaning up and containerizing removed or disturbed hazardous materials.

5. The stop work directive remains in effect and the removal contractor shall not resume work that will disturb previously undisturbed hazardous containing material until directed in writing by the Monitoring Firm.

3.5 MAINTENANCE AND CLEANING OF ENCLOSURES

A. Contractor's supervisor shall inspect barriers twice per work shift, prior and after completion of the day's activities.

B. Repair damage and defects immediately upon discovery.

C. Smoke tube testing of all isolation barriers, decontamination facilities, and regulated removal work areas prior to beginning removal activities and shall occur once a day whenever removal activities or cleaning occurs.

D. HEPA vacuum or wet decontamination enclosures / airlocks at the end of each workshift.

E. Accumulations of dust or debris shall be cleaned off all surfaces on a daily basis using HEPA vacuum and / or wet cleaning methods.

3.6 HANDLING AND REMOVING HAZARDOUS MATERIAL

A. Any release of hazardous materials constitutes unlawful disposal under 40 CFR 264 or 40 CFR 761. Contractor shall be strictly responsible for any and all costs resulting from unlawful disposal of hazardous materials wholly or partially due to their actions or inaction.

B. Prohibited Work Methods:

1. Use of high-speed grinding or abrasion machines without integral shroud with HEPA-vacuum attachment.
2. Work or cleanup methods that cause dust to become airborne, such as dry sweeping, or use of compressed air for cleaning.
3. Use of pressurized water.
4. Any work method that creates visible emissions.

C. All interior work shall be performed within a negative pressure containment.

D. If at any time contractor's exterior work methods create visible emissions, work methods shall be modified to ensure no visible emissions occur. Upon the second occurrence of visible emissions, all future exterior work shall be performed within tents.

E. Hazardous Materials Removal

1. Remove all hazardous material containing caulk from adjacent surfaces.

2. Where hazardous material containing caulk abuts non-porous, cleanable glass or metal scheduled for removal, the surface may be cleaned to Visual Standard No.2, Near-White Blast Cleaned Surface Finish, of the National Association of Corrosion Engineering (NACE) and dispose of the non-porous materials as non-hazardous contaminated material in lieu of disposing of the item as hazardous contaminated material.

3. Where hazardous material containing caulk abuts painted metal to be cleaned or desired to be cleaned by the Contractor prior to disposal, all paint shall be removed and disposed as hazardous contaminated material.

4. Where hazardous material containing caulk abuts porous material scheduled to remain, at a minimum, remove the surface of the porous material sufficiently to remove all residual caulk from pits, grooves, etc. at the point of contact of the caulk. Perform removal to leave a smooth surface.

5. Provide two separate layers of encapsulant.

   a. Follow manufacturer recommendations
   b. Each coat shall be a separate and distinct color.
   c. Color of each coat colors shall be as approved by the architect and may include "special colors".
   d. System total shall be a minimum of 10 mils.

6. Where hazardous material containing caulk abuts porous material scheduled for removal, remove a minimum of 6 inches of adjacent material and dispose as hazardous contaminated material.

7. Installation of new work that will disturb porous materials within three inches of original caulk shall be performed in accordance with this specification.

F. Waste Clean-Up

1. All accumulations of hazardous waste material shall be containerized using HEPA vacuums or rubber or plastic dustpans, squeegees or shovels.

   a. Surfaces shall be HEPA vacuumed after gross cleanup.
   b. Waste during removal and initial cleanup shall be immediately bagged, wrapped or containerized upon removal.
   c. Cleanup shall be performed whenever enough loose debris/waste material has been removed to fill a single leak-tight container.

2. Containerize all removed materials, including non-porous components that Contractor has not elected to clean to a Visual Standard No.2, Near-White Blast Cleaned Surface Finish, of the National Association of Corrosion Engineering (NACE).

G. Packaging Waste

1. All waste shall be packaged, labeled and marked for transport and disposal in accordance with applicable requirements of 6 NYCRR 372 and 49 CFR 172, 173, 178 and 179.

   a. Marking Format:

      1) "HAZARDOUS WASTE –Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.

      2) Generator's Name and Address _____

      3) Generator's EPA Identification Number _____

      4) Manifest Tracking Number _____"

2. All waste generated shall be bagged, wrapped or containerized immediately upon removal. Cleanup accumulations of loose debris/waste material whenever enough loose debris/waste material has been generated to fill a single leak-tight container.

H. Final Cleaning

1. First Cleaning: All surfaces of the regulated work area shall be HEPA-vacuumed.

2. Second Cleaning

   a. Non-porous surfaces shall be wet-cleaned using rags, mops and sponges.
   b. Porous surfaces shall be HEPA-vacuumed a second time.

3.7 TRANSPORTATION AND DISPOSAL PROCEDURES

A. Temporary On-Site Storage and Protection: Provide storage on site of hazardous materials removed from service and scheduled for disposal complying with requirements of 6 NYCRR 372.2 (a) (8). Do not exceed 90 days storage on site.

B. Hazardous Waste Determination: Provide analysis required by Treatment, Storage or Disposal facility to document hazardous waste determination.

C. Hazardous Waste Manifests

1. Provide and complete the Uniform Hazardous Waste Manifest, obtained from a USEPA Approved Registered Printer.

2. Maintain manifest from date of transport until date of disposal, destruction or recycling.

3. Return fully executed manifests to Owner within 30 days of date waste left site for review and signature.

4. Use following type of manifest as applicable:

a. If waste is to be disposed of in New York State or if waste is to be disposed of in state not requiring use of specific manifest form, use New York State Uniform Hazardous Waste Manifest;

b. If the waste is to be disposed of in state other than New York State and that state requires use of specific manifest form, use manifest required by state where waste is to be disposed in lieu of New York State Uniform Hazardous Waste Manifest.

D. Disposal - Transport hazardous waste to treatment or disposal facility that:

1. Is permitted, licensed or registered by state to dispose of hazardous waste;

2. Has interim status to dispose of hazardous waste;

3. Is authorized to manage hazardous waste under Resource Conservation and Recovery Act (RCRA) or

4. Is facility which:

a. Beneficially uses or reuses, or legitimately recycles or reclaims its waste; or
b. Treats its waste prior to beneficial use or reuse, or legitimate recycling or reclamation.

3.8 ADJUSTING/CLEANING

A. At least weekly, remove from building site debris, rubbish, and other materials resulting from hazardous material disposal operations.

1. If additional hazardous materials are encountered during hazardous material disposal operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

2. Burning of removed materials not permitted on Project Site.

3. Transport materials removed and legally dispose off-site.

B. Sweep building broom clean at end of each workday and on completion of hazardous material removal operations.

C. Upon completion of hazardous material removal, remove tools, equipment, and demolished materials from Site. Remove protections and leave interior areas broom clean. Change filters on air-handling equipment to remain.

3.9 FIELD QUALITY CONTROL

A. The Owner reserves the right to engage a Project Monitoring firm to perform Monitoring services, take samples, and prepare reports.

B. Laboratory Certification: Each laboratory used shall be approved by the New York State Department of Health's Environmental Laboratory Approval Program (NYSDOH ELAP) for the analysis performed.

C. Contractor to:

1. Provide Monitoring firm with access to work area(s) to perform necessary inspections, sampling, etc. prior to, during and after completion of removal activities.
2. Provide Monitoring firm with ladders, lifts, safety equipment, electrical power, lighting, etc.
3. Coordinate with Monitoring firm for scheduled work. Provide a minimum of 48 hour notice for additional shifts / weekend work.

D. Clearance Inspections

1. Supervisor shall perform a completeness of removal and cleaning visual inspection after completion of all removal and cleaning work.

    a. Supervisor inspection shall successfully document completeness of removal and cleaning prior to requesting an inspection from the Project Monitor.
    b. Supervisor shall document the results of the inspection in the Daily Project Log.

2. Project Monitor visual inspection

    a. The Project Monitor shall perform a visual inspection to determine the completeness of removal and cleaning
    b. Both the Project Monitor and the Supervisor shall document the findings of the inspection in the Contractor Daily Project Log.

3. Clearance Criteria: Once the area has successfully passed the Supervisor and Project Monitor final visual inspection and achieved required air sampling clearance criteria, the area is considered to have successfully achieved clearance criteria. The work area may then be dismantled.

END OF SECTION 02 84 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, accessories, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Concrete reconstruction and corrective work.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: For each type of product indicated.

a. Fiber reinforcement.
b. Vapor barrier.
c. Concrete sealer.
d. Curing compound.
e. Interior Slab control joint sealer.
f. Penetrating silane sealer.
g. Non-Shrink Grout.
h. Shrinkage compensating concrete.
i. Chemical anchor adhesives.
j. Corrective mortar (industry name is Repair mortar).
k. Thin coat patching mortar.
l. Corrective overlayment (industry name is Repair overlayment).

2. Design Mixtures: For each concrete mixture.

    a. Indicate amounts of mixing water to be withheld for later addition at Project site.
    b. Include compressive strength test reports.
    c. Include all ingredient certifications and product data concurrently.
    d. Pumping of concrete requires a mix design specifically prepared and previously used for pumping.
    e. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

3. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar and welded-wire reinforcement sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Show all concrete wall and footing reinforcement on elevation drawings at a scale not less than 1/4-inch = 1 ft. Do not submit placement plans showing only piece marks referencing a cut list.

4. Formwork Shop Drawings: Prepared by, or under the supervision of, a qualified professional engineer detailing fabrication, assembly, and support of formwork. Submit elevation views showing panel layout dimensions, joint and tie hole locations.

5. Slab-on-Grade Control Joint Layout Drawings: Indicate joints as shown on Drawings and proposed locations following required spacing requirements.

B. Informational Submittals:

1. Proposed curing method for all concrete elements.
2. Curing compound compatibility with floor finishes and adhesives certificate.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. 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.

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 to perform material evaluation tests and to design concrete mixtures.

1. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Structural Preconstruction Conference: Attend conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

1. Store reinforcement to avoid contact with earth.
2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.

B. Comply with ASTM C94/C94M and ACI 301.

C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips 3/4 by 3/4 inch, minimum, unless otherwise noted on drawings.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. 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. VOC compliant.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
B. Plain-Steel Welded Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For exterior concrete, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or Type II. Supplement with the following (optional):

   a. Fly Ash: ASTM C 618, Class F or C.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595 – Type IL, portland limestone; Type IS, portland blast-furnace slag; Type IP, portland-pozzolan; Type I (PM), pozzolan-modified portland; or Type I (SM), slag-modified portland cement.

B. Normal-Weight Aggregates:

1. Provide aggregates from a single source.

2. ASTM C 33, Class 3S coarse aggregate or better, graded.

3. ASTM C 33, Class 4S coarse aggregate or better, graded, for exterior concrete.

4. Maximum Coarse-Aggregate Size:

    a. Slabs on Grade: 1-1/2 inches nominal.
    b. All Other Concrete: 1 inch nominal.
    c. For pumpable mixes: 3/4 inch nominal.

5. Fine Aggregate: ASTM C 33. Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 1602/C 1602M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing chlorides.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Accelerating Admixture: ASTM C 494/C 494M, Type C.
4. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
5. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
6. Mid-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type A or Type F. Water content reduction to be greater than 7%.
7. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
8. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
9. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 FIBER REINFORCEMENT

A. Synthetic Macro-Fiber: Polyolefin macro-fibers (containing no reprocessed olefin materials) engineered and designed for use as secondary reinforcing in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 1/4 to 2-1/4 inches long, varying fiber thickness, and no water absorption.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. 3M; Scotchcast Polyolefin Fibers 2".
    b. Master Builders Solutions US LLC; “MasterFiber MAC” Series.
    c. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF.
    d. FORTA Corporation; FORTA FERRO.
    e. GCP Applied Technologies Inc.; Strux 90/40.
    f. Nycon, Inc.; XL.
    g. Sika Corporation; Fibermesh 650.

B. Synthetic Micro-Fiber: Polyolefin micro-fibers (containing no reprocessed olefin materials) engineered and designed for use as secondary reinforcing in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 3/4 inches long, varying fiber thickness, and no water absorption.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Master Builders Solutions US LLC; "MasterFiber M 100" Series
b. Euclid Chemical Company (The), an RPM company; PSI Fiberstrand 150.
c. FORTA Corporation; MIGHTY MONO.
d. GCP Applied Technologies Inc.; SINTA M2219

2.7 VAPOR BARRIER

A. Vapor Barrier: Water-vapor transmission rate (permeance) less than 0.015 perms (gr/ft^2/hr/in-Hg), in accordance with ASTM E 1745. The product must meet water-vapor transmission rate (0.01 perms) requirement for both the new material and the ASTM E 1745 mandatory conditioning tests (ASTM E 1745; paragraphs 7.12 through 7.15.) Provide all manufacturers' accessories required for complete installation including mastic and seam tape. Seam tape to be provided with a water-vapor transmission rate of 0.3 perms or lower.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Layfield Construction Materials; VaporFlex 15.
b. Reef Industries, Inc.; Griffolyn Vaporguard.
c. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.8 SEALED CONCRETE

A. Sealer: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ChemMasters; Chemisil Plus.
b. ChemMasters; StarSeal PS Clear.
c. ChemTec Int'l; ChemTec One.
d. Curecrete Distribution Inc.; Ashford Formula.
e. Dayton Superior Corporation; Day-Chem Sure Hard Densifier (J-17).
f. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
g. Kaufman Products, Inc.; SureHard.
h. Laticrete International, Inc.; L&M Seal Hard.
i. Meadows, W. R., Inc.; LIQUI-HARD.
j. Metalcrete Industries; Floorsaver.
k. Nox-Crete Products Group; Duro-Nox.

2.9 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap–polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F: Black.
b. Ambient Temperature Between 50 and 85 deg F: Any color.
c. Ambient Temperature Above 85 deg F: White.

B. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1-D, Class B, dissipating, with fugitive dye.

C. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ½-inch rigid, extruded polystyrene insulation (at exterior walls), ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

B. Interior Slab Control Joint Sealer: Two-component, self-leveling, flexible, 100 percent solids, epoxy resin and adhesive with a Type A shore durometer hardness of 80 per ASTM D 2240 and conforming to ACI 302.1R (5.12-Joint Materials).

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Chem Masters; PolyTops 480.
b. Euclid Chemical Company (The); DURAL 340 SL
c. Sika Corporation; Sikadur 51 SL.

C. Penetrating, Silane Sealer: Single component, minimum 40% silane, waterbased slab sealer that forms chemical bond to the concrete. VOC compliant.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Chem Masters; Aquanil Plus 40.
b. Dayton Superior Corporation; Weather Worker 40% J29.
c. Sika Corporation; Sikagard H 400

D. Bond breakers: Waterborne, VOC compliant form release agent.

E. Non-Shrink Grout: ASTM C 1107, factory-packaged, shrinkage-resistant, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

F. Shrinkage Compensating Concrete: high strength, high flow, low shrinkage, pumpable mixture of expansive cement, microsilica, and fine and coarse aggregate.

1. Basis of design: Subject to compliance with requirements, provide Form & Pour Concrete Mix MS by Quikrete Companies, LLC.

G. Chemical Anchor Adhesives: Heavy duty, two component injectable adhesive designed to be dispensed using double chamber gun with mixing nozzle. Adhesives in capsule form will not be accepted.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. DeWalt.; AC200+
b. Hilti, Inc.; Hit-HY 200A; Hit-HY 200R
c. ITW Redhead; A7+.

2.11 RECONSTRUCTION AND CORRECTIVE MATERIALS

A. Corrective Mortar (Industry name is Repair Mortar): Site-mixed Portland-cement mix for vertical and overhead surfaces. Mix dry-pack corrective mortar, consisting of one part shrinkage-compensating, Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve by damp, loose volume, using only enough water for handling and placing.

B. Thin Coat Patching Mortar: Polymer modified, Portland cement, suitable for interior and exterior applications. Featheredge up to 3/16 inch. For thicker applications manufacturer's recommendations to extend mix with an aggregate may apply.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ChemMasters, Inc.; Thin Patch
b. Euclid Chemical Company (The); Duraltop Flowable Mortar.
c. Sika Corporation; SikaFloor QuartzTop 115.

C. Corrective Overlayment (Industry name is Repair Overlayment): Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations. For thicker applications manufacturer's recommendations to extend mix with an aggregate may apply.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 25 percent, but if used, a minimum of 15 percent.

a. In exterior slabs, limit fly ash to a maximum 25 percent by weight of the total cementitious materials.

2. Combined Fly Ash and Pozzolan: 25 percent.

a. In exterior slabs, limit combined fly ash and pozzolan to a maximum 35 percent by weight of the total cementitious materials.

3. Ground Granulated Blast-Furnace Slag: 50 percent.

a. In exterior slabs, limit slag to a maximum 50 percent by weight of the total cementitious materials.

4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

a. In exterior slabs, limit the combined fly ash or pozzolans and slag to a maximum 50 percent by weight of the total cementitious materials.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in all concrete. Design mix for optimum placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use a mid-range, water-reducing admixture in pumped concrete, all concrete slabs (including concrete walks), concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings, Piers, Foundation Walls, and Grade Beams: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.

2. Maximum Water-Cementitious Materials Ratio: 0.50.

3. Slump Limit: 4 inches, plus or minus 1 inch; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Interior Slabs-on-Grade and Elevated Slabs: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Minimum Cementitious Materials Content: 470 lb/cu. yd..
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
6. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture, at concrete batch facility, at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd..

2.14 CONCRETE MIXTURES FOR EXTERIOR CONCRETE

A. Exterior Architectural Concrete Elements And Retaining Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4500 psi at 28 days.

2. Maximum Water-Cementitious Materials Ratio: 0.45.

3. Slump Limit: 4 inches, plus or minus 1 inch; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Exterior Slabs (concrete pads, walks, ramps, stairs, and curbs): Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5000 psi at 28 days.

2. Maximum Water-Cementitious Materials Ratio: 0.40.

3. Slump Limit: 4 inches, plus or minus 1 inch; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

5. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture, at concrete batch facility, at manufacturer's recommended rate, but not less than 3.0 lb/cu. yd..

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade conditions are satisfactory prior to forming or pouring concrete. Owner’s Testing Agency shall inspect slab and footing subgrade prior to placing concrete.
B. Verify that reinforcing, including masonry dowels, is properly in place prior to pouring concrete.
C. Verify that formwork is complete and properly secured prior to placing concrete.
D. Proceed with installation only after unsatisfactory conditions have been corrected.
E. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class C, 1/2 inch for rough-formed finished surfaces without additional finish, permanently exposed.
3. Class D, 1 inch for concealed, rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

K. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

L. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

M. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

N. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

O. For smooth-rubbed finish, provide uniform spacing and size of cone ties which break off at least 1-1/2 inches from face of concrete and leave holes not more than 1-inch diameter in face of concrete.

3.3 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

2. Install leveling plates, bearing plates, railing sleeves, brackets, and all other embedded steel items shown on Drawings.

3. Install sleeves for pipe, conduit and other items passing through cast-in-place structural concrete. Coordinate with other trades for sleeve details, invert elevations, locations, and sizes.

3.4 REMOVING AND REUSING FORMS

A. General: Formwork for sides of walls, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and provide corrective work to surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 VAPOR BARRIERS

A. Place, protect, and correct vapor barrier according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.
2. Terminate vapor barrier at the top of floor slabs, grade beams, and walls, sealing entire perimeter to floor slabs, grade beams, or foundation walls.
3. Seal penetrations in accordance with vapor barrier and retarder manufacturer’s instructions.
4. Protect vapor barrier and retarder during placement of reinforcement and concrete.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor barrier. Correct damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging, but not less than 24 inches on center.

1. Lap edges and ends of adjoining sheets at least one mesh spacing plus 2 inches.
2. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
3. Lace overlaps with wire.

F. Field bending or straightening of bars partially embedded in concrete is permitted only where shown on the Drawings.

G. All openings in concrete walls with a dimension of one foot or greater are to have two #5 bars on all sides of opening, unless noted otherwise.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate horizontal joints in walls at underside of floors, slabs, and at the top of footings or floor slabs.

4. Locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

5. Roughen surface of hardened concrete, wet surface, and immediately pour fresh concrete against wet surface.

C. Vertical Control Joints in Walls: Space vertical control joints in walls that have any portion exposed to public view as shown on Drawings or, if not indicated, at 20 feet maximum.

D. Control joints in Slabs-on-Grade: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Space joints as shown on Drawings or, if not indicated, at 12 feet average spacing and not exceeding 15 feet. Locate joints at column centerlines where possible.

E. Isolation Joints in Slabs-on-Grade: Install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

F. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, (4.3.2.1 Slump Adjustment.)

1. With each concrete mixture submittal, indicate amounts of mixing water to be withheld for later addition at Project site.

2. Water added must not increase the water-cement ratio past the approved mix design ratio.

3. Add additional water reducer or plasticizer to mix instead of adding water to achieve flowable, workable concrete. Do not add water to concrete after adding these admixtures to mixture.

4. Do not add water after truck is more than half empty.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

a. Do not use vibrators to transport concrete inside forms.

b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.

c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

d. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

3. Concrete placed over steel deck is to have a minimum thickness as shown on the Drawings. Thickness of the slab will be greater at the center of the beam or deck spans as they deflect during casting of the concrete. Estimated deflections of the composite beams due to the wet weight of the concrete are indicated on the plans. Compensate for beam deflection by adding additional concrete as required near the center of the beam span.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Level concrete, cut high areas, and fill low areas.
5. Slope surfaces uniformly to drains where required.
6. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
7. Do not further disturb slab surfaces before starting finishing operations.

E. For pumpable mixes: refer to ACI 304.2R “Guide to Placing Concrete by Pumping Methods”.

F. 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 average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and ACI 305R and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects corrected and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Correct and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, or to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

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.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

1. Contractor to coordinate concrete finish with floor finish plan and floor finish manufacturer requirements, and provide the appropriate surface.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings. Do not add water to concrete surface.

1. For fiber reinforced concrete, to provide consolidation and bury surface fibers, open slab surfaces to be struck off with a vibrating screed or laser screed. Where a laser screed is used, adjust the magnitude of vibration and control the speed of the refracting leveling head to ensure adequate consolidation of the concrete and embedment of the fibers. Magnesium floats in the form of a bullfloat, channel radius float, or highway straightedge to be used to establish a surface and close tears or open areas. Do not use wood floats.

2. Flatness and Levelness: Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

   a. Moderately Flat: Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15; for slabs to receive vinyl composition tile,.

   b. Very Flat for Slabs on Grade: Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24; for slabs to receive epoxy terrazzo.

3. For all floor finish classifications, also measure floor finish tolerances after slab has cured and dried out, within 2 weeks before installation of floor finish materials to establish compliance with flooring manufacturer's tolerance requirements and to determine if corrective leveling is required.

D. Trowel and Fine-Broom Finish: After applying a first trowel finish and while concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete walks, slabs, platforms, steps, ramps, and elsewhere as indicated.

1. 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. For synthetic fiber reinforced concrete, pull broom in a single direction and do not excessively overlap previously textured concrete.

F. Exterior Concrete Walks and Slabs: Apply penetrating, silane sealer per manufacturer's instructions.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 and 305.1 for hot-weather protection during curing.

B. Slabs: Protect slabs within building from precipitation accumulation. Immediately remove water, snow or ice from surface of slabs within building regardless if source is from precipitation, construction activities, etc.

C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

E. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces. Protect all slabs from precipitation accumulation.

F. Cure concrete according to ACI 308.1, by one of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately correct any holes or tears during curing period using cover material and waterproof tape.

    a. Use moisture-retaining covers to cure all interior slabs on grade.
    b. Use moisture-retaining covers to cure all items to receive penetrating silane sealer.

2. 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 correct damage during curing period.

G. Exposed Architectural Concrete Surfaces: From time of pour, to Final Completion, protect all Architectural Concrete elements from damage, disfiguration, discoloration, staining, and all other types of damage which would affect the final appearance of the Architectural Concrete elements. Protection is to include, but is not limited to:

1. All hydraulic powered equipment must be diapered to avoid staining on the concrete.
2. Drops cloths need to be placed under vehicles/equipment at all times.
3. No pipe cutting machines shall be used on the slabs.
4. Steel shall not be placed on slabs to avoid rust staining.
5. Provide shields and other protective elements over Architectural Concrete elements.

3.13 SEALED CONCRETE

A. Sealer: Prepare, apply, and finish sealer according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface corrective work.

2. Do not apply to concrete that is less than 28 days old.

3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.14 JOINT SEALING

A. Prepare, clean, and install slab control joint sealer according to manufacturer's written instructions.

1. Defer joint sealing until concrete has aged at least one month(s). Do not seal joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint sealer full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint sealer flush with top of joint after hardening.

3.15 CONCRETE SURFACE CORRECTIVE WORK

A. Defective Concrete: Correct and patch defective areas when approved by Architect. Remove and replace concrete that cannot be corrected and patched to Architect's approval.

B. Correcting Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins, exposed or otherwise visible fiber reinforcement, and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Remove exposed or otherwise visible fiber reinforcement from the concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with corrective mortar before bonding agent has dried. Fill form-tie voids with corrective mortar or cone plugs secured in place with bonding agent.

2. Correct defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, corrective mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Correct defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

C. Correcting Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Correct finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions such as exposed or otherwise visible fiber reinforcement.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Remove exposed or otherwise visible fiber reinforcement from the concrete surface. If concrete surface is damaged by the process of fiber removal, correct surface as described by the remainder of this section.

4. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with thin coat patching mortar. Finish corrected areas to blend into adjacent concrete.

5. Correct other low areas scheduled to remain exposed with a corrective overlayment. Cut out low areas to ensure a minimum corrective overlayment depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply corrective overlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Correct defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Correct random cracks and single holes 1 inch or less in diameter with corrective overlayment. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete. Place corrective overlayment before surface has dried. Finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.16 FIELD QUALITY CONTROL

A. Testing and Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports, except where noted.

B. Contractor to supply all batch tickets to Owner's testing agency. Batch tickets to note quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, w/c ratio and amount of water allowed to be added at Project site.

C. Inspections:

1. Steel reinforcement placement.

2. Chemical Anchors: Test 5% of all chemical anchors in tension, randomly selected but in varied locations. Testing to be in accordance with ASTM E 488 to the approved manufacturer's allowable loads. Concrete must cure a minimum of 3 days prior to testing. Do not test anchors until after the anchor manufacturer's recommended curing time. If an anchor fails during this test additional anchors may be requested to be tested as directed by the Architect.

3. Headed bolts and studs.

4. Verification of use of required design mixture.

5. Concrete placement, including conveying and depositing.

6. Curing procedures and maintenance of curing temperature.

7. Verification of concrete strength before removal of shores and forms from beams and slabs.

8. Vapor barrier inspection after installation. To be performed by the vapor barrier manufacturer. Verify correct installation according to specifications and details. To be performed no more than 48 hours prior to slab pour.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day, nor less than once per each 5000 square foot of surface area of walls or slabs.

   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. Include corresponding concrete mix batch tickets with each test report.

3. Indicate amount of water added to batch at Project site.

4. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change. Measure after slump adjustment.

    a. Pumped concrete is to be tested at point of placement, with an additional slump test taken at point of delivery.

5. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

6. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

7. Density (Unit Weight): ASTM C 138/C 138M, fresh unit weight of concrete. Two tests per truck load; one at beginning of pour and near end of pour.

8. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

9. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and standard cure six (6) cylinder specimens for each composite sample.
    b. Cast and field cure two (2) standard cylinder specimens for each composite sample.
    c. Autoclave curing and oven-drying of test specimens containing synthetic fiber is not permitted.

10. Compressive-Strength Tests: ASTM C 39/C 39M;

    a. Test two standard cured specimens at 7 days, three specimens at 28 days, and retain one specimen for testing at 56 days as deemed necessary by Architect.

    b. Test two field-cured specimens at 28 days.

    c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

    d. If one specimen in the test shows evidence of improper sampling, molding or testing, discard the specimen and consider the strength of the remaining cylinders to be the test result. If more than one specimen in a test shows any defects, discard the entire test.

11. Test for workability and air content of each synthetic fiber reinforced concrete mixture composite sample taken according to ASTM C172 (except that wet-sieving is not permitted) and whenever consistency of concrete appears to vary, according to ASTM C 1116.

12. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

13. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

14. Test results shall be reported in writing to Architect, 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.

15. Nondestructive Testing: Impact-echo, ultrasonic methods, or other nondestructive methods may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

16. 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 Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

17. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

18. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.17 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION 03 30 00

SECTION 03 54 15 – MOISTURE CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes moisture control system for concrete surfaces below hydraulic-cement-based underlayment and interior floor coverings.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Moisture control system.
2. Crack and joint filler.
3. Patching compound.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by manufacturers of moisture control system, underlayment and floor covering system certifying that products are compatible.

1.6 CLOSEOUT SUBMITTALS

A. Warranty: Executed special warranty.
B. Warranty: Each product warranty.
C. Agreement to Warranty: Signed by manufacturer of moisture control system confirming agreement to warranty the system.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of moisture control system products required for this Project.
B. Product Compatibility: Manufacturers of moisture control system, underlayment and floor covering system certify in writing that products are compatible.
C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting moisture control system performance.

1. Place moisture control system only when ambient temperature and temperature of substrates are between 50 and 80 deg F. Expedite installation if substrate and site conditions are above 70 deg F.

2. Place moisture control system only when building is enclosed, with permanent HVAC system operating.

1.10 COORDINATION

A. Coordinate application of moisture control system with requirements of underlayment products, specified in other Division 03 Sections, and with requirements of floor covering products, including adhesives, specified in Division 09 Sections, to ensure compatibility of products.

1.11 WARRANTY

A. Special Warranty: Moisture control system manufacturer's standard form in which manufacturer agrees to repair or replace moisture control system that does not comply with requirements to properly control moisture within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MOISTURE CONTROL SYSTEM

A. Moisture Control System: One-component epoxy-based moisture control system “Ardex MC Rapid” consisting of primer, P-4 and sealer coats.

B. Sand: Fine sand less than 1/50 of an inch in grain size or 98.5 percent passing sieve size #35. Keep sand clean and dry as per manufacturers recommendation.

C. Crack and Joint Filler: Two-part epoxy crack and joint filler.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Ardex Ardifix Joint Sealant.

D. Patching Compound: Portland cement-based smoothing compound.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Ardex; K-60, K-301 and MRP.

E. Water: Potable and at a temperature of not more than 70 deg F.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. File pre-installation checklist with manufacturer and obtain manufacturer’s written agreement to warranty and confirmation of approval to proceed.
2. Proceed with application only after unsatisfactory conditions have been corrected.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through moisture control system.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair moisture control system bond. Prepare surface to achieve minimum surface profile of ICRI CSP #3 (light shot blast).

1. Apply patching compound to pre-smooth concrete where mechanical preparation results in a surface exceeding limits set by moisture control system manufacturer.

C. Testing: Test substrates for moisture vapor emissions in accordance with either of the following methods:

1. Moisture Testing Method 1: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 20 lb.

2. Moisture Testing Method 2: Perform relative humidity test, ASTM F 2170. Proceed with installation only after substrates do not exceed a maximum relative humidity of 95 percent as measured by a Wagner Rapid RH probe.

3.3 APPLICATION

A. General: Mix and apply moisture control system components according to manufacturer's written instructions.

1. Close areas to traffic during moisture control system application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum substrate and intercoat adhesion.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through moisture control system.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply sealer coat over primer at manufacturer’s recommended spreading rate. While sealer coat is fresh, broadcast sand layer at manufacturer’s recommended spreading rate.

D. Unless otherwise recommended by manufacturer, allow system to cure for at least 16 hours before broom sweeping and vacuuming to remove excess sand.

E. Do not allow traffic of any type on unprotected moisture control system.

F. Apply compatible underlayment over moisture control system after time period recommended in writing by manufacturer.

3.4 PROTECTION

A. Protect moisture control system during installation of construction over system and for remainder of construction period.

END OF SECTION 03 54 15

SECTION 03 54 16 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hydraulic-cement-based, polymer-modified, self-leveling underlayment for infilling below interior floor coverings.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Infill.
2. Aggregate.
3. Self-leveling Underlayment.
4. Primer.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of infill and underlayment products required for this Project.
B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.
C. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.9 COORDINATION

A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, specified in Division 09 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

A. Fill System: Light-weight fast-setting, Portland cement-based system that can be applied in minimum uniform thickness of 3/4 inch .

1. Basis-of-Design Product: Subject to compliance with requirements, provide ARDEX LW concrete fill system from Ardex Americas, or comparable products by manufacturer providing products equal to Basis-of-Design Product.

a. System includes:

1) Primer: ARDEX P 51
2) Infill: ARDEX K 520
3) Aggregate: ELEMIX beads by Syntheon Inc.

2. Primer: Solvent-free primer for the installation of infill and underlayments.

3. Infill: Lightweight, fast-setting, Portland cement-based deep fill layer from a minimum of 3/4inch.

4. Compressive Strength: Not less than 5500 psi at 28 days when tested according to ASTM C109/C109M.

5. Aggregate: lightweight polymeric and expanded polystyrene beads, with negligible water absorption, of sizes “C” or “B”, uniformly mixed with infill at 1:1 ratio.

B. Underlayment: Hydraulic cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thickness of 1/4inch.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ARDEX K 15 from Ardex Americas, or comparable products by manufacturer providing products equal to Basis-of-Design Product.

C. Water: Potable and at a temperature of not more than 70 deg F.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

C. Infill Substrate (for Underlayment): Remove any loose or exposed aggregate beads, and clean per manufacturer's written instructions.

D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 FILL SYSTEM APPLICATION

A. General: Mix and apply infill components according to manufacturer's written instructions.

1. Close areas to traffic during infill application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum infill-to-substrate and intercoat adhesion.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply infill to produce uniform, level surface, and within 1/4-1/2 inch of finished floor elevation.

D. Cure infill according to manufacturer's written instructions. Prevent contamination during application and curing processes.

3.4 UNDERLAYMENT APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions to provide a smoothing course.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.

B. Apply primer over prepared infill at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.5 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 54 16

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Concrete building brick.
3. Face brick.
4. Building (common) brick.
5. Mortar and grout.
6. Steel reinforcing bars.
7. Masonry-joint reinforcement.
8. Ties and anchors.
9. Embedded flashing.
10. Miscellaneous masonry accessories.
11. Water-repellent treatment.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Cavity wall insulation.
3. Cast stone columns and sills.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).
B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. CMUs.
2. Concrete building brick.
3. Building (common) brick.
4. Portland cement.
5. Colored cement products.
6. Aggregate for mortar.
7. Masonry-joint reinforcement for single-wythe masonry.
8. Individual anchors.
9. Anchors for connecting CMU to existing masonry.
10. Adjustable anchors for connecting to structural steel framing.
11. Adjustable anchors for connecting to structural steel columns at isolated pilasters.
12. Joint stabilization anchors.
13. Adjustable masonry-veneer anchors.
14. Adhesives, primers, and seam tapes for flashings.
15. Proprietary cleaner.
16. Water-repellent treatment.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Face brick.
2. Water-repellent admixture.
3. Flexible flashing.
4. Drip plate flashing.
5. Termination bars for flexible flashing.
6. Compressible filler.
7. Preformed control-joint gaskets.
8. Weep/cavity vent products.
9. Cavity drainage material.

C. Shop Drawings: For the following:

1. Concrete Masonry Control Joint Layout Plans: Show all concrete masonry unit control joint locations, at minimum 1/8 inch = 1 ft. scale.

    a. For each joint, indicate type of control joint; i.e., at columns, indicate if joint is provided by the masonry grouted into the column web, or by a joint-stabilization anchor.

    b. Indicate control joint location and type in accordance with the typical masonry plan details shown on the Drawings and as specified.

D. Samples for Initial Selection:

1. Face brick, in the form of portable display panels.
2. Colored mortar.

E. Samples for Verification: For each type and color of the following:

1. Face brick, in the form of straps of five or more bricks.
2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.7 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C67.
d. For masonry units, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include name of manufacturer, brand name, and type.

3. Water-repellent admixture used in mortar.

4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

5. Grout mixes. Include description of type and proportions of ingredients.

6. Joint reinforcement.

7. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602.

1.8 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 Section "Quality Requirements".

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 48 inches high.

2. Build sample panels facing south.

3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.

4. Clean one-half of exposed faces of panels with masonry cleaner indicated.

5. Protect approved sample panels from the elements with weather-resistant membrane.

6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

7. Demolish and remove sample panels when directed by Architect.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups for typical exterior wall in sizes approximately 96 inches long by 96 inches high by full thickness, including face wythe, metal studs, sheathing, air barrier, veneer anchors, insulation, cavity drainage material, and weeps.

a. Include a sealant-filled joint at least 16 inches long in mockup.

b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.

c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall 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).

2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.

3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.

4. Protect accepted mockups from the elements with weather-resistant membrane.

5. 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 does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. 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.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 FIELD 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 of walls, and hold cover securely in place.

    2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed 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 three 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 spreading coverings 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.

D. 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 TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

2.4 CONCRETE MASONRY UNITS

A. Where fire-resistance-rated construction is indicated, use the equivalent thickness method for masonry units in accordance with ACI 216.1/TMS 0216.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

C. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Lightweight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide uniform fine texture units suitable for painting.

D. Concrete Building Brick: ASTM C55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
2. Density Classification: Lightweight.
3. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

2.5 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.

4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: Facing brick complying with ASTM C216.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hoosier Blend Modular by Bowerston Shale Company from Bowerston Plant, or comparable product.

2. Grade: SW.

3. Type: FBS.

4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C67.

5. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."

6. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

7. Application: Use where brick is exposed unless otherwise indicated.

8. Where shown to "match existing" provide face brick matching color range, texture, and size of existing adjacent brickwork.

C. Building (Common) Brick: ASTM C62, Grade SW.

1. Size: Match size of face brick.
2. Application: Use where brick is indicated for concealed locations.

2.7 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated.

a. Color: As selected from manufacturer's standard colors to match existing..

2. Pigments shall not exceed 10 percent of portland cement by weight.

E. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C404.

G. Water: Potable.

2.8 REINFORCEMENT

A. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Mill- galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter (9 gage).
4. Wire Size for Cross Rods: 0.148-inch diameter (9 gage).
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

B. Masonry-Joint Reinforcement for Single-Wythe Masonry: Horizontal ladder or truss type with single pair of side rods.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Heckmann Building Products Inc., Div. of US Masonry and Building Products; Ladder-Type Wall Reinforcement (1100) or Truss Type Wall Reinforcement (1200).

b. Hohmann & Barnard, Inc.; 220 Ladder Mesh Reinforcement or 120 Truss-Mesh.

c. Wire-Bond; Series 200 Ladder Mesh or 300 Truss Mesh 2 Wire.

2.9 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Individual Anchors: Provide anchors that allow vertical adjustment.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Heckmann Building Products Inc., Div of US Masonry and Building Products; Dovetail Triangular Veneer Anchor (#103-C).
b. Hohmann & Barnard, Inc.; 345-BT Flexible Tie.
c. Wire-Bond; #2102 Dovetail Triangular Tie.

2. Connector Section: Tab formed from 0.105-inch-thick (12 gage) steel sheet, hot-dip galvanized after fabrication.

3. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized steel wire, sized to extend within one inch of masonry face.

4. Anchor: weld to steel; 1/4-inch-diameter hex-head concrete screw anchor, 1-1/4-inch length (minimum) for connecting to masonry or concrete.

D. Anchors for Connecting CMU to Existing Masonry: Provide anchors that resist tension and compression forces perpendicular to plane of wall.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Heckmann Building Products Inc., Div. of US Masonry and Building Products; #103 C Dovetail Triangular Veneer Anchor.
    b. Hohmann & Barnard, Inc.; #315 Flexible Dovetail Brick Tie.
    c. Wire-Bond; #2102 Dovetail Triangular Tie.

2. Connector Section: Dovetail clips attached to tie section with hole for anchoring to existing wall; formed from 0.105-inch-thick (12 gage) steel sheet, hot-dip galvanized.

3. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter hot-dip galvanized wire.

4. Anchor: 1/4-inch-diameter hex-head concrete screw anchor; 1-1/4-inch length (minimum).

E. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Heckmann Building Products Inc., Div. of US Masonry and Building Products; #317 Continuous Weld-On Anchor Rods and #316 Web Ties.
    b. Hohmann & Barnard, Inc.; 359-C - Weld-On Ties and VBT – Vee Byna-Ties.
    c. Wire-Bond; #1002 Type I Continuous Weld-On Anchors and #1100 Triangular Ties.

2. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.

3. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized steel wire.

F. Adjustable Veneer Anchors to Structural Steel Provide individual anchors that allow vertical adjustment.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Heckmann Building Products Inc., Div of US Masonry and Building Products; Double Pintle Brick Veneer Anchor (#213) and Double Pintle Tie (#263).
    b. Hohmann & Barnard, Inc.; Veneer Anchor Plates with 2X-Hook (HB-213-2X).
    c. Wire-Bond; Adjustable Veneer Anchor (#2401 RJ-711) with Double Hook (#2402).

2. Anchor Section: Plate formed from 0.0747-inch-thick (14 gage) steel sheet, hot-dip galvanized after fabrication.
3. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized steel wire, sized to extend within one inch of masonry face.

G. Joint Stabilization Anchors: Provide anchors that bond masonry walls across expansion and control joints while allowing lateral movement, made from hot-dip galvanized-steel.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Heckmann Building Products Inc., Div. of US Masonry and Building Products; Control Joint Anchor (353).
b. Hohmann & Barnard, Inc.; Slip-Set Stabilizer.
c. Wire-Bond; #1700 Control Joint Anchor.

H. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.

2. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.

3. Screw-Attached, Thermally-Isolated, Masonry-Veneer Anchors: Wire tie and a corrosion-resistant, self-drilling, barrel screw designed to receive wire tie. Barrel has gasketed washer head that covers hole in insulation.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Heckmann Building Products Inc., Div. of US Masonry and Building Products; Pos-I-Tie ThermalClip System (Original Pos-I-Tie Veneer Anchoring Clip (75), Pos-I-Tie ThermalClip (75TC), and Pintle Wire Tie for ThermalClip (282-N)).

2) Hohmann & Barnard, Inc.; Thermal 2-Seal Wing Nut Anchor and 2X Hook Wall Ties.

3) Wire-Bond; Sure Tie WS Anchoring System (#4522 SureTie WS, #4590 Thermal Grip Washer, and #4515 SureTie WS Adjustable Double Hook).

2.10 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use the following unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth/polymer fabric; non-asphaltic type. Use only where flashing is fully concealed in masonry.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Advanced Building Products, Inc.; Copper Sealtite 2000.
2) Wire-Bond; Copper Seal (Copper Fabric Flashing) #4140.
3) York Manufacturing, Inc.; Multi-Flash 500.

B. Drip Plate Flashing: Fabricate from copper to shape indicated, including inside corners, outside corners, and end dams. Provide hemmed edge drip plate flashing materials with foam seal and adhesive strip as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hohmann & Barnard, Inc.; FTS Series Drip Plate or comparable product.
2. Width: Not less than 3 inches.
3. Copper: 16-oz./sq. ft.

C. 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.

D. Termination Bars for Flexible Flashing: Stainless steel bars not less than 1/8 inch by 1 inch.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Heckmann Building Products Inc., Div. of US Masonry and Building Products; Termination Bar (1050).
b. Hohmann & Barnard, Inc.; T1 - Termination Bar.
c. Wire-Bond; #4200 Termination Bar.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Hohmann & Barnard, Inc.; NS – Closed Cell Neoprene Sponge.
b. Wire-Bond; #3300 Expansion Joint.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Hohmann & Barnard, Inc.; RS Series – Rubber Control Joint.
b. Wire-Bond; Rubber Control Joint.

C. Weep/Cavity Vent Products: Use the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Advanced Building Products, Inc.; Mortar Maze Weep Vents.
2) Heckmann Building Products Inc., Div. of US Masonry and Building Products; Cell Vent (85).
3) Hohmann & Barnard, Inc.; QV – Quadro-Vent.
4) Wire-Bond; #3601 Cell Vent.

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Hohmann & Barnard, Inc.; Mortar Trap.
b. Mortar Net Solutions; WallDefender.
c. Wire-Bond; Cavity Net DT.

2. Configuration: Provide one of the following:

a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

b. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.

2.12 MASONRY CLEANERS

A. Proprietary Cleaner: 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. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Prosoco, Inc.

2.13 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including 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. Use portland cement-lime mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For concrete masonry unit backup in exterior walls, masonry bearing walls, shear walls and masonry below grade or in contact with earth, use Type S. Not for use in masonry veneer construction.

2. Use Type N mortar in all masonry veneer construction and in all masonry construction other than noted in the requirements for Type S mortar above.

D. Pigmented Mortar: Use colored cement product.

1. Application: Use pigmented mortar for exposed mortar joints with the following units:

    a. Face brick.

E. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that foundations are within tolerances specified.
2. Verify that reinforcing dowels are properly placed.
3. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. 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.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. 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 C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.

3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.

5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.

7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.

2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.

4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. 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.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.

2. Fasten top-of-wall wind clips to structure above. Grout cells of CMUs solidly and space clips four feet on center maximum or as indicated on Drawings.

3. Fasten concealed wind anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors, and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors as indicated on Drawings.

4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E. Cut joints flush where indicated to receive air barriers unless otherwise indicated.

3.6 COMPOSITE MASONRY

A. Bond wythes of composite masonry together as follows:

1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

    a. Use adjustable-type (two-piece-type) reinforcement.

B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

1. Provide continuity with masonry-joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.

3.7 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

a. Use adjustable-type (two-piece-type) reinforcement.

2. Adjustable Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity.

C. Install air barrier system to comply with Division 07 Section “Fluid-Applied Membrane Air Barriers.”

D. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach 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.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation, air barrier, and masonry.

3.8 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.

2. Embed tie sections in masonry joints.

3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

B. Provide not less than 2 inches of airspace between back of masonry veneer and face of insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace.

3.9 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.10 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.

2. Anchor masonry with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally.

3.11 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

1. Locate joints as indicated on Drawings; if not indicate, locate vertical joints not more than 20 feet o.c. for expansion joints in masonry veneer and 24 feet o.c. for control joints in concrete masonry.

B. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.
2. At steel columns, construct control-joint according to Drawings.

C. Form expansion joints in brick as follows:

1. Build in compressible joint fillers where indicated.

2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.12 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 12 inches, and at least 6 inches above the top of cavity drainage material or to height as recommended by cavity drainage material manufacturer. Fasten upper edge of flexible flashing to inner wythe through termination bar.

3. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 12 inches, and at least 6 inches above the top of the cavity drainage material or to height as recommended by cavity drainage material manufacturer. Fasten upper edge of flexible flashing to sheathing through termination bar.

4. Apply a continuous bead of compatible sealant to the top of the termination bar.

5. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

6. Install metal drip plate flashing beneath flexible flashing at exterior face of wall as recommended by manufacturer. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip plate flashing.

C. 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.

D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.

E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install cavity vents in head joints in exterior wythes at 24 inches o.c. unless otherwise indicated. Use specified weep/cavity vent products to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.14 REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. 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 that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.15 FIELD QUALITY CONTROL

A. Testing and Special Inspections: Owner will engage special inspector and qualified testing and inspecting agency to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level 2 in TMS 402.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

I. Reinforcement Inspections: Inspect reinforcement for size and placement.

J. Grout and Mortar Inspection: Inspect grout and mortar mixing operations to ensure mix proportions and procedures comply with specified requirements.

K. Tie and Anchor Inspections: Inspect ties and anchors for type, spacing, and proper installation.

L. Flashing and Accessories Inspections: Inspect flashing and accessories for type and proper installation.

M. Cold-Weather and Hot-Weather Inspections: Inspect masonry construction operations for compliance with specified cold-weather and hot-weather procedures.

3.16 CORRECTING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

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 cleaning of masonry.

3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

7. Clean masonry with a proprietary cleaner applied according to manufacturer's written instructions.

3.17 WATER-REPELLENT TREATMENT APPLICATION

A. Preparation: Allow CMU installation to age before application of water-repellent treatment, according to repellent manufacturer's written instructions.

B. Cleaning: Before application of water-repellent treatment, clean substrate of substances that could impair penetration or performance of product according to water-repellent treatment manufacturer's written instructions.

C. Proceed with application only when existing and forecasted weather and substrate conditions permit water-repellent treatments to be applied according to manufacturers' written instructions.

D. Apply water-repellent treatment on surfaces to be treated in accordance with manufacturer's written instructions for application procedure unless otherwise indicated.

END OF SECTION 04 20 00

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Trim units.
2. Decorative elements.
3. Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Initial Selection: For colored mortar.

D. Samples for Verification:

1. For each color and texture of cast stone required, 4 inches square in size.
2. For each trim shape required, 4 inches in length.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

1. Include copies of material test reports, indicating compliance of cast stone with ASTM C1364.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C1364.

1. Provide test reports based on testing within previous six months.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by CSI or APA.

B. Furnish cast stone for installation in mockups specified in Section 04 20 00 "Unit Masonry."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work.

B. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. 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.

2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.6 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Cast Stone: Obtain cast stone units from single source from single manufacturer.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST STONE MATERIALS

A. General: Comply with ASTM C1364.

B. Portland Cement: ASTM C150/C150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C114. Provide natural color or white cement as required to produce cast stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C33/C33M; gradation and colors as needed to produce required cast stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C33/C33M, gradation and colors as needed to produce required cast stone textures and colors.

E. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.

2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.

3. Air-Entraining Admixture: ASTM C260/C260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.

4. Water-Reducing Admixture: ASTM C494/C494M, Type A.

5. Water-Reducing, Retarding Admixture: ASTM C494/C494M, Type D.

6. Water-Reducing, Accelerating Admixture: ASTM C494/C494M, Type E.

G. Reinforcement:

1. Deformed steel bars complying with ASTM A615/A615M, Grade 40. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.

   a. Epoxy Coating: ASTM A775/A775M.
   b. Galvanized Coating: ASTM A767/A767M.

2. Plain-Steel, Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

3. Galvanized-Steel, Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.

4. Fiber Reinforcement: ASTM C1116/C1116M.

2.3 CAST STONE UNITS

A. Available manufacturers offering products that may be incorporated into the work, include but are not limited to the following:

1. Architectural Cast Stone

B. Cast Stone Units: Comply with ASTM C1364.

1. Units are manufactured using the manufacturer's selected method.
2. Trim units including window sills and string course.
3. Decorative elements including column covers with Tuscan capitals and bases.

C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

D. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.

2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.

3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.

4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

E. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.

2. Keep units damp and continue curing to comply with one of the following:

a. No fewer than five days at mean daily temperature of 70 deg F or above.
b. No fewer than seven days at mean daily temperature of 50 deg F or above.

F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

G. Colors and Textures: Match existing stone sills.

2.4 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666.

B. Dowels: 1/2-inch- diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666.

C. Proprietary Acidic Cleaner: 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 cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
b. EaCo Chem, Inc.
c. PROSOCO, Inc.

2.5 MORTAR MIXES

A. Comply with requirements in Section 04 20 00 "Unit Masonry" for mortar mixes.

B. Do not use admixtures including 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. Use portland cement-lime mortar cement mortar unless otherwise indicated.

C. Comply with ASTM C270, Proportion Specification.

1. For setting mortar, use Type N.
2. For pointing mortar, use Type N.

D. Preblended dry mortar mix complying with ASTM C1714/C1714M and capable of producing mortar strength as indicated in ASTM C270.

1. For setting mortar, use Type N.
2. For pointing mortar, use Type N.

E. Pigmented Mortar: Use colored cement product.

1. Pigments do not exceed 10 percent of portland cement by weight.
2. Application: Use pigmented mortar for exposed mortar joints.

F. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Application: Use colored-aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

A. Set cast stone as indicated in TMS 604.

B. Install cast stone units to comply with requirements in Section 04 20 00 "Unit Masonry."

C. 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. Coordinate installation of cast stone with installation of flashing specified in other Sections.

D. Wet joint surfaces thoroughly before applying mortar or setting in mortar.

E. Set units in full bed of mortar with full head joints unless otherwise indicated.

1. Set units with joints 3/8 to 1/2 inch wide unless otherwise indicated.
2. Build anchors and ties into mortar joints as units are set.
3. Fill dowel holes and anchor slots with mortar.
4. Fill collar joints solid as units are set.
5. Build concealed flashing into mortar joints as units are set.

6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
7. Keep joints at shelf angles open to receive sealant.

F. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

G. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

H. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

I. Rake out joints for pointing with sealant to depths of not less than 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.

J. Point joints with sealant to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

1. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

K. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Build in compressible foam-plastic joint fillers where indicated.
3. Form joint of width indicated, but not less than 3/8 inch.
4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

3.3 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set cast stone as indicated in TMS 604.

B. 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 necessary to secure units in place.
2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.

C. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.

D. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.

E. 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.

F. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.

1. Form open joint of width indicated, but not less than 3/8 inch.

G. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

H. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.

3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

5. Clean cast stone by methods described in Cast Stone Institute Technical Bulletin #39.

6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Fiberglass reinforced polymer (FRP) fabrications
3. Primer.
4. Non-Shrink Grout.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by ANSI/AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: For each type of product indicated.

a. High-strength bolts, nuts and washers
b. Direct-tension indicators
c. Zinc-coated high strength bolts, nuts and washers
d. Tension-control, high-strength bolt-nut-washer assemblies
e. Zinc-coated tension-control, high-strength bolt-nut-washer assemblies
f. Shear stud connectors
g. Headed anchor rods
h. Threaded rods
i. Post-installed Anchors
j. Clevises and turnbuckles
k. Eye Bolts and nuts
l. Sleeve nuts
m. Structural slide bearings
n. Fiberglass reinforced polymer structural shapes
o. Galvanizing repair paint
p. Non-Shrink Grout
q. Prefabricated fireproof steel columns

2. Shop Drawings: Show fabrication of structural-steel components.

    a. Include FRP structural shapes with structural steel shop drawings.

    b. Anchor Rod/Embedded Item Layout Plans and Details: Show anchor rod layout, dimensions, elevation, orientation and details of anchor rods, leveling plates and other items embedded in concrete.

        1) Submit anchor rod/embedded item plans and obtain Architect's approval prior to submitting erection plans.

    c. Erection Plans and Details: Include member layout, dimensions, elevations, member sizes, erection details, and all information required for erection.

        1) Submit erection plans and obtain Architect's approval prior to submitting fabrication details.

    d. Fabrication Details: Submit drawings indicating all details necessary for shop fabrication and erection of each individual steel member.

        1) Detail simple shear connections to withstand loads indicated and comply with other information and restrictions indicated.

            a) Select and complete connections using ANSI/AISC 360 and LRFD.

            b) Provide connections, at a minimum, sized for beam end reactions shown on Drawings and per Tables 10-1, 10-2, 10-3 or 10-4, ANSI/AISC Steel Construction Manual. Unless otherwise noted, beam end reactions are given at factored load level.

        2) Include details of cuts, connections, splices, camber, holes, and other pertinent data.

        3) Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

        4) Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

        5) Identify members not to be shop primed.

B. Informational Submittals:

1. Mill test reports for structural steel, including chemical and physical properties.

2. Product Test Reports: For the following:

a. Bolts, nuts, and washers including mechanical properties and chemical analysis.
b. Fiberglass reinforced polymer structural shapes.
c. Non-shrink grout.

C. Closeout Submittals:

1. Record Drawings: Provide complete set of erection and fabrication drawings with all construction changes incorporated.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU is preferred. At least 10 projects completed of a similar size and scope to Project.

1. If fabricator is not designated an AISC-Certified Plant, see Source Quality Control Article for Contractor responsibilities.

2. A qualified manufacturer of FRP material that is certified to the ISO-9001:2000 standard and with a minimum of five years' experience in the manufacture of FRP structural shapes.

B. A qualified fabricator of FRP material with a minimum of five years' experience in the fabrication of FRP structural shapes. Installer Qualifications: At least 10 projects completed of similar size and scope.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High Strength Bolts."

E. Structural Preconstruction Conference: Attend conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 3125, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

1.7 COORDINATION

A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Angles: ASTM A 572/A 572M, Grade 50.

C. Plate and Bar: ASTM A 36/A 36M.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.

E. Welding Electrodes:

1. Welding Electrodes shall conform to AWS classification E70XX, and shall comply with all AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts, 3/4-inch diameter unless noted otherwise on Drawings; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

B. Headed Anchor Rods: ASTM F 1554, Grade 36.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain.

C. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Plain.

D. Post-installed Anchors: Chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 Type III Fe/Zn 5 unless otherwise indicated.

2. Chemical Anchor Adhesives: Heavy duty, two component injectable adhesive designed to be dispensed using double chamber gun with mixing nozzle. Adhesives in capsule form will not be accepted.

a. Products for anchoring into concrete and grout-filled masonry: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) DeWalt; AC200+.
2) Hilti, Inc.; HIT-HY 200R; HIT-HY 200A.
3) ITW Redhead; A7+.

b. Products for anchoring into masonry other than grout-filled masonry: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) DeWalt; AC100+ Gold.
2) Hilti, Inc.; HIT-HY 270.
3) ITW Redhead; A7+.

2.3 FIBERGLASS REINFORCED POLYMER STRUCTURAL SHAPES

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. Fibergrate Composite Structures, Inc.
2. Southwell Corporation.
3. Strongwell Corporation.
4. Structural Fiberglass, Inc.

B. General Material Properties:

1. All materials are to be manufactured by the pultrusion process with a glass content minimum of 45 percent, maximum of 55 percent by weight.

2. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

3. Resins shall be non-fire retardant isophthalic polyester with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties as required.

4. All finished surfaces of FRP shapes shall be smooth, resin rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

5. All material shall be further protected from ultraviolet (UV) attack with integral UV inhibitors in the resin and a synthetic surfacing veil to produce a resin rich surface.

C. Structural Properties: FRP material to meet the following minimum longitudinal mechanical properties:

Property	**ASTM Method**	**Value**
Tensile Strength	D 638	20,000 psi
Tensile Modulus	D 638	1.8×10^6 psi
Flexural Strength	D 790	24,000 psi
Flexural Modulus	D 790	2.0×10^6 psi
Coefficient of Thermal Expansion	D 696	8.0×10^{-6} in/in/deg F
Flame Spread	E 84	25 or less

2.4 PRIMER

A. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

B. Provide primers that comply with Division 09 Section “High Performance Coatings” and the following:

1. Interior Structural Steel: Refer to First Coat for Steel, Structural Steel in Interior High-Performance Coating Schedule: General Use.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it and meeting ASTM A 780.

2.5 NON-SHRINK GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, shrinkage-resistant, nonmetallic aggregate grout, noncorrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to ANSI/AISC's "Code of Standard Practice for Steel Buildings and Bridges" and ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Holes to be standard holes unless shown otherwise on Drawings.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

G. FRP Structural Shapes:

1. Measurements: Structural Shapes supplied shall meet the minimum dimensional requirements as shown or specified. The Contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions as required by manufacturer to complete the work. Determine correct size and locations of required holes or coping from field dimensions before structural shape fabrication.

2. Sealing: All shop fabricated cuts or drilling shall be coated with vinyl ester resin to provide maximum corrosion resistance.

3. All finished surfaces of FRP items and fabrications shall be smooth, resin rich, free of voids and without dry spots, cracks, crazes or unreinforced areas.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened or pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.8 SHOP PRIMING

A. Shop prime the following structural steel members only:

1. Interior structural steel exposed to view, and interior lintels.
2. Structural steel in exterior walls and lintels in exterior walls.

B. For members to receive primer leave following locations unprimed:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Galvanized surfaces unless noted to be primed.

C. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to Division 09 Section “High Performance Coatings”.

1. ASTM D 6386, “Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting,” for galvanized surfaces noted to be painted.

D. Priming:

1. Immediately after surface preparation, apply one coat of primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

a. Stripe paint corners, crevices, bolts, welds, and sharp edges.
b. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: If fabricator is not designated an AISC-Certified Plant then the Contractor shall engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using High Strength Bolts."

D. Welded Connections: Shop welds will be visually inspected according to AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

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.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to ANSI/AISC 303 and ANSI/AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with non-shrink grout.

4. Promptly pack non-shrink grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect non-shrink grout and allow to cure. Comply with manufacturer's written installation instructions for non-shrink grouts.

C. Column Base Plates and Anchor Bolts: Not designed to resist lateral loads and overturning during erection; base plates and anchor bolts are designed only to comply with the minimum requirements of the OSHA "Safety Standards for Steel Erection".

D. Maintain erection tolerances of structural steel within ANSI/AISC's "Code of Standard Practice for Steel Buildings and Bridges."

E. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

F. Splice members only where indicated.

G. Do not use thermal cutting during erection.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

I. FRP Structural Shapes:

1. Provide anchorage devices and fasteners for securing FRP fabrications as shown on Drawings.

2. Perform cutting, drilling and fitting required for installation of FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; measured from established lines and levels.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened or pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in ANSI/AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform tests and inspections as described below.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using High Strength Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

D. Post-installed Chemical Anchors: Test 5% of all chemical anchors in tension, randomly selected but in varied locations. Testing to be in accordance with ASTM E 488 to the approved manufacturer's allowable loads. Concrete or masonry wall must cure a minimum of 3 days prior to testing. Do not test anchors until after the anchor manufacturer's recommended curing time. If an anchor fails during this test additional anchors may be requested to be tested as directed by the Architect.

E. Record position and alignment of erected steel. Compare with required tolerances.

F. Verify compliance with details shown on approved drawings such as bracing, stiffening, member location, and proper application of joint details at each connection.

G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 CORRECTIONS AND PROTECTION

A. Field Corrections: Do not field correct any framing member or connection without prior approval of Architect. Submit detail of proposed field correction to Architect including component sizes, dimensions, weld sizes, cut locations, etc.

B. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and touchup galvanizing to comply with ASTM A 780.

C. Touchup Priming: Cleaning and touchup priming are specified in "High Performance Coatings" section.

D. FRP Structural Shape Sealing:

1. All field fabricated cuts or drilling shall be coated with vinyl ester resin to provide maximum corrosion resistance in accordance with the manufacturer's instructions.

END OF SECTION 05 12 00

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.
3. Accessories.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of deck, accessory, and product indicated.

1. Deck Primer Test Reports: Provide documentation of primer compatibility with finish paint.

B. Shop Drawings:

1. Deck Placement Drawings: Include layout and types of deck panels, support locations, anchorage details, dimensions, panel lengths, edge of deck or pour stop distance and each condition requiring closure panels, reinforcing channels, cut deck openings, special jointing, accessories including rubber flute closure locations, and attachments to other construction.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of steel deck.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC – "Standard for Quality Control and Quality Assurance for Installation of Steel Deck" and the following:

1. AWS D1.1/D1.1M – "Structural Welding Code – Steel".
2. AWS D1.3/D1.3M – "Structural Welding Code – Sheet Steel".

B. Qualifications:

1. Fabricator:

a. Submit documentation showing at least 5 completed projects of similar size and scope.
b. Submit documentation showing current membership with Steel Deck Institute (SDI).

2. Installer:

a. Submit documentation showing at least 5 completed projects of similar size and scope.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store products in accordance with SDI MOC3 – "Manual of Construction with Steel Deck". Stack steel deck off the ground on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

C. Do not place deck bundles on unbolted structural steel frames, or on unattached or unbridged joists. Do not place bundles on unbraced structural frame.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

A. Roof Deck: Design and fabricate panels, without top-flange stiffening grooves, to comply with SDI RD – “Standard for Steel Roof Deck," and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: Type WR, wide rib.
3. Profile Depth: As indicated on Drawings.
4. Design Uncoated-Steel Thickness: As indicated on Drawings.
5. Span Condition: Triple span or more, unless otherwise shown on Drawings.
6. Side Laps: Flat overlapped.

2.3 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C - “Standard for Composite Steel Floor Deck-Slabs", with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Profile Depth: As indicated on Drawings.
3. Design Uncoated-Steel Thickness: As indicated on Drawings.
4. Span Condition: Triple span or more, unless otherwise shown on Drawings.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, carbon-steel, self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 20 gauge (0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

F. Galvanizing Repair Paint: ASTM A 780.

G. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Standards, manufacturer's written instructions, approved deck placement shop drawings and requirements in this Section.

B. Locate deck bundles to prevent overloading of structural members.

C. Do not use deck units for storage or working platforms until permanently secured in position.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened.

E. Place deck panels flat and square and fasten to supporting frame without warp or excessive deflection. Do not stretch or contract side lap interlocks.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck. Provide neat, square and trim cuts.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in accordance with deck manufacturer’s written instructions.

3.3 ROOF-DECK INSTALLATION

A. Permanently fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.

B. Side-Lap and Perimeter Edge Fastening:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. Fastening Spacing: Provide fasteners at no greater than maximum spacing listed in the table below. Weld intermediate and end supports of deck units with a minimum of two welds per deck unit at each support. Fasten side-laps at intervals not exceeding the lesser of 1/2 of the span or per the table below.

	Deck Designation	Intermediate Supports (inches)	End Supports (inches)	Edge Supports (inches)	Side Laps (inches)
1.	WR…….	12	12	24	24

D. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum for WR deck.

E. Reinforcement at Openings: For openings less than 13 inches in any dimension not reinforced with supplemental structural framing, provide additional metal reinforcement and closure pieces as required for strength and continuity of decking, and support of other work.

1. Reinforce roof deck with flat sheet steel placed over opening and fastened to top of deck.

   a. For openings up to 6 inches in diameter, no reinforcing is necessary.

   b. For openings 6 inches to 8 inches in diameter, provide no less than nominal 0.045 inch (18 gauge) thick before coating, and at least 12 inches wider and longer than opening.

   c. For openings 8 inches to 13 inches in diameter, provide no less than nominal 0.057 inch (16 gauge) thick before coating, and at least 12 inch wider and longer than opening.

2. Fasten using one No. 10 screw at each corner, at each up-flute and spaced not more than 12 inches along each side.

F. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, flat plates at change of deck direction, butt strips, finish strips, end closures, and reinforcing channels and all other miscellaneous shapes as shown on plans according to deck manufacturer's written instructions, and as required to provide suitable surface for application of roof insulation and roof covering. Fasten with No. 10 screws at 12 inches maximum to provide a complete deck installation.

G. Roof Insulation Support: Provide and install metal accessories to provide suitable surface for application of insulation.

3.4 FLOOR-DECK INSTALLATION

A. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

B. Fasten floor-deck panels to concrete supporting members by concrete screws as indicated on Drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 4 inches, with butted end joints.

D. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

E. Deck Accessories to Supporting Members: Fasten in accordance with manufacturer's recommendations.

F. Deck Openings: Cut and reinforce all holes or openings in floor as shown on manufacturer's placement drawings.

3.5 CORRECTIVE WORK

A. Galvanizing touchups: Prepare and touchup damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: Wire brush and clean rust spots, welds, and abraded areas on top surface of prime-painted deck immediately after installation and apply repair paint.

1. Wire brushing, cleaning, and touchup painting of bottom deck surfaces are included in Division 09 Section.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field Inspections:

1. Material Inspection: Select six (6) random sheets for each type of deck used. Inspect for thickness, type and material.

2. Fastening Inspection: Inspect welds and side lap fasteners over entire deck area for size and spacing and weld quality.

3. Roof Deck Conditions Inspection: Before installation of roof insulation and roof covering, inspect the deck for tears, dents or other damage that may prevent the deck from supporting the required loads, or be visually objectionable in exposed deck areas. Report suspect areas to Architect to determine need for repair or replacement.

4. Floor Deck Conditions Inspection: Before concrete placement, inspect the deck for tears, dents or other damage that may prevent the deck from acting as a tight and substantial form. Inspect deck for dirt, ice, water, oils or other materials that could prevent or inhibit composite action forming between deck and hardened concrete. Report suspect areas to Architect to determine need for repair, replacement or cleaning.

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.

3.7 PROTECTION

A. Hanging Loads (All Contractors): Do not hang any concentrated loads from metal deck unless otherwise noted and detailed on Drawings.
B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.
C. Do not use deck units for storage or working platforms until permanently secured.

END OF SECTION 05 31 00

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following cold-formed metal framing ("CFMF") elements:

1. Exterior non-load-bearing wall framing.
2. Ceiling/soffit joist framing.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design cold-formed steel framing, including comprehensive engineering analysis by a qualified professional engineer (licensed in the State of New York), using performance requirements and design criteria indicated and certifying that the design complies with the Building Code of New York.

B. Structural Performance: Provide cold-formed metal framing capable of withstanding applied design loads and all combinations of these loads, as required by applicable codes and as specified on Drawings, within limits and under conditions indicated.

1. Design Loads: Dead, live, snow and snow drifting, ponding, wind, seismic and thermal loads, loads due to architectural and mechanical components.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Non-Load-Bearing Framing: Horizontal deflection of the wall height of 1/600 for masonry veneer.
b. Ceiling/Soffit Joist Framing: Vertical deflection of 1/240 of the span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 3/4 inch.

C. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

D. Minimum Thickness and Maximum Spacing Requirements: Comply with the requirements of this specification for specific requirements for minimum thickness and maximum spacing for cold-formed metal framing components.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated Design Submittal: For cold-formed metal framing indicated to comply with performance requirements and design criteria, including structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Description of design criteria.
2. Structural analysis depicting stress and deflection requirements for each framing application.
3. Selection of framing components and accessories.
4. Design and verification of connections.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Expansion anchors.
2. Power-actuated anchors.

1.7 QUALITY ASSURANCE

A. Cold-formed Metal Framing Installer Qualifications: At least 5 years experience in construction of cold-formed metal framing systems similar in scope to application shown on Documents with record of successful in-service performance for prior projects.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver materials and components to Site in manufacturer's unopened packages, containers or bundles, fully identified with brand name, type, grade and identification of manufacturer or supplier.

B. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

C. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. AllSteel Products, Inc.
2. ClarkWestern Building Systems, Inc.
3. Dietrich Metal Framing; a Worthington Industries Company.
4. MarinoWare; a division of Ware Industries.
5. MBA Building Supplies, Inc.
6. Super Stud Building Products, Inc.
7. United Metal Products, Inc.
8. Telling Industries, LLC.

2.2 MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 54 mils for masonry veneer back-up.
2. Minimum Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 33 mils or at least matching steel studs.
2. Minimum Flange Width: 1-1/4 inches.

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 54 mils.
2. Flange Width: 1 inch plus the design gap for 1-story structures.

2.4 CEILING/SOFFIT JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with enlarged service holes, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 33 mils.
2. Minimum Flange Width: 2 inches.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.

4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Hole reinforcing plates.
10. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight matching associated member.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.

2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

5. Splices in axially loaded members not acceptable.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

D. Touch-up all welds with galvanizing primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. 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.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions", manufacturer's written instructions, Drawings, and approved Shop Drawings unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.

2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:

1. Maximum Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deflection tracks and anchor to building structure. Do not fasten studs to deflection track.
2. Install double deep-leg deflection tracks and anchor outer track to building structure. Do not fasten tracks together.

E. Install headers and sills for wall openings wider than stud spacing. Locate headers and sills at openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on approved Shop Drawings. Fasten jamb members together to uniformly distribute loads.

2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding and space jack studs same as full-height wall studs.

F. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

a. Install solid blocking at centers indicated on approved Shop Drawings.

2. Bridging may be one of the following types:

a. Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

b. Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

c. Proprietary bridging bars installed according to manufacturer's written instructions.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on approved Shop Drawings.

B. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated on approved Shop Drawings.

C. Install bridging at intervals indicated on approved Shop Drawings. Install prior to application of loads. Fasten bridging at each joist intersection.

1. Bridging may be one of the following:

a. Joist-track solid blocking of width and thickness indicated, secured to joist webs.

b. Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

2. Provide end blocking where joist/rafter ends are not restrained against rotation.

D. Do not install web knock-outs within 1.5 times depth of member from edge of bearing, unless necessary. Where required, reinforce web.

E. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor to provide access to construction for inspections to verify conformance with provisions of Contract Documents and approved Shop Drawings. Inspections to include but not limited to, the following:

1. Verify member sizes, configuration and spacing.
2. Inspect screwed and welded connections.
3. Inspect weld quality.
4. Verify field welder's certification.
5. Verify galvanizing primer has been applied to all welds and damaged galvanized surfaces.
6. Verify compliance with details shown on approved drawings such as bracing, stiffening, member location, and proper application of joint details at each connection.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 CORRECTIONS AND PROTECTION

A. Galvanizing Repairs: Prepare and correct 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. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Miscellaneous steel trim.
5. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts indicated to be cast into concrete or built into unit masonry.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Slotted channel framing.
2. Metal nosings and treads.
3. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 COORDINATION

A. Coordinate installation of anchorages. 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Channels and Angles: ASTM A 572/A 572M, Grade 50.

B. Steel Plates and Bars: ASTM A36/A36M.

C. Steel Tubing: ASTM A500, cold-formed steel tubing.

D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches or as indicated on drawings.
2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
3. Fasteners and Fittings: Appropriate to situation and as recommend by manufacturer.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Post-installed Anchors: chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5 unless otherwise indicated.

2. Chemical Anchor Adhesives: Heavy duty, two component injectable adhesive designed to be dispensed using double chamber gun with mixing nozzle. Adhesives in capsule form will not be accepted.

a. Products for anchoring into concrete and grout-filled masonry: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) DeWalt; AC200+.
2) Hilti, Inc.; HIT-HY 200R; HIT-HY 200A.
3) ITW Redhead; A7+.

b. Products for anchoring into masonry other than grout-filled masonry: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) DeWalt; AC100+ Gold.
2) Hilti, Inc.; HIT-HY 270.
3) ITW Redhead; A7+.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Primer:

1. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

2. Provide primers that comply with Division 09 Section “High Performance Coatings” and the following:

a. Interior Structural Steel: Refer to First Coat for Steel, Structural Steel in Interior High-Performance Coating Schedule: General Use.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with ASTM A780/A780M and compatible with paints specified to be used over it.

D. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items 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. Form exposed work with accurate angles and surfaces and straight edges.

E. 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. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 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.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

2.8 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. 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.

2.10 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Finish metal fabrications after assembly.
C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

A. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to Division 09 Section “High Performance Coatings”.

1. For galvanized surfaces noted to be painted, comply with ASTM D6386, “Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting”.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Metal Fabrications: For all iron and steel items (except those noted below), shop prime with alkyd primer.
2. Exterior Wall Metal Fabrications: For all iron and steel items occurring in exterior walls, shop prime with urethane primer.

D. Shop Priming: Immediately after surface preparation, apply one coat of primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness as listed below. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

D. Field Welding: Comply with the following requirements:

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. 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.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Install slotted channel framing with manufacturer recommended fasteners and fittings and follow manufacturer recommended instructions.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use non-shrink, nonmetallic grout in exposed locations unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Section "High-Performance Coatings."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and restore galvanizing to comply with ASTM A780.

END OF SECTION 05 50 00

SECTION 05 52 13 - TUBE RAILINGS (STAINLESS STEEL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Stainless-steel tube railings.
2. Stainless-steel fittings, brackets, and other railing accessories.

1.3 COORDINATION

A. Coordinate installation of anchorages for railings. 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. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
2. Railing brackets, flanges, fittings, and anchors.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

1. Include sample.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

C. Shop Conditions: Maintain shop conditions in a clean manner to prevent contamination of stainless-steel surfaces.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides minimum 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STAINLESS STEEL

A. Tubing: ASTM A269, Grade MT 316L.
B. Castings: ASTM A743/A743M, Grade CF 8M or CF 3M.
C. Sheet, Strip, Plate, and Flat Bar: ASTM A666, Type 316L.
D. Bars and Shapes: ASTM A276, Type 316L.

2.4 FASTENERS

A. General: Provide the following:

1. Stainless-Steel Railings: Type 316 stainless-steel fasteners.
2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

1. Material: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonexpanding, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. 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.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

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 flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form Changes in Direction as Follows:

1. As detailed.
2. By radius bends of radius indicated.

J. Close exposed ends of railing members with prefabricated end fittings.

K. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns.

L. Brackets, Flanges, Fittings, and Anchors: Provide stainless-steel wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. Concealed Anchorage Brackets (Cast Type):

a. Basis-of-Design Product: Subject to compliance with requirements, provide R & B Wagner, Inc.; Handrail Bracket 1729-2, or comparable product.

1) Description: Cast round saddle with tapped mounting hole, brushed satin finish, Type 304.

a) Secure handrail to bracket with countersunk, tamper-resistant screws.

2. Concealed Anchorage Brackets (Assembled Type):

a. Basis-of-Design Product: Subject to compliance with requirements, provide R & B Wagner, Inc.; Handrail Bracket RB34125.4, or comparable product.

1) Description: Round saddle with tapped mounting hole, high luster finish, Type 316L.

a) Secure handrail to bracket with countersunk, tamper-resistant screws.

3. Exposed Anchorage Brackets:

a. Basis-of-Design Product: Subject to compliance with requirements, provide R & B Wagner, Inc.; Traditional Wall Mount Cast Bracket 1815, or comparable product.

1) Description: Round saddle with one mounting hole, high luster finish, Type 316L.

a) Fully weld connection between handrail bracket and handrail in shop prior to erection in field.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.7 STAINLESS-STEEL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Remove tool and die marks and stretch lines, or blend into finish.

C. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

D. Stainless Steel Tubing Finishes:

1. 180-Grit Polished Finish: Uniform, directionally textured finish.

E. Stainless Steel Sheet and Plate Finishes:

1. Directional Satin Finish: ASTM A480/A480, No. 4.

F. Passivating: When polishing is completed, passivate all surfaces, including areas sensitive to corrosion, including welded areas and adjacent heat-affected zones, perforated surfaces, etc. Follow passivating procedure established by standard industry best practices to thoroughly remove embedded foreign matter and leave surfaces chemically clean. Rinse thoroughly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components, unless otherwise indicated. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post. Apply bead of clear silicone to provide smooth transition at joint.

3.4 ANCHORING POSTS

A. Use stainless-steel sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, in two applications.

B. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as indicated.

C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Return railing ends at walls to within 1/2 inch of wall; provide fully-welded end closure of railings, ground smooth.

B. Return railing ends to posts; fully welded to posts, ground smooth.

C. Attach railings to wall with wall brackets. Provide brackets with minimum 1-1/2 inch clearance from inside face of handrail and finished wall surface.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.

3.6 ADJUSTING AND CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water and wiping dry.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 05 52 13

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood-preservative-treated lumber.
2. Miscellaneous lumber (non-treated).

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Wood-Preservative-Treated Lumber: Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

E. Application: Treat items indicated on Drawings, and the following:

1. Wood nailers, blocking, and similar members in connection with flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 MISCELLANEOUS LUMBER (NON-TREATED)

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.
4. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. 3 grade; SPIB.
2. Hem-fir or hem-fir (north); Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir; Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.5 MISCELLANEOUS MATERIALS

A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in New York State Building Code.
2. ICC-ES evaluation report for fastener.

I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

1. Provide 1/4-inch vent space between each length of blocking.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 INSTALLATION OF WOOD FURRING

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Special Inspections are required for the work of this Section. Refer to Division 01 Section “Quality Requirements” and its attachments.

END OF SECTION 06 10 00

SECTION 06 10 26 - ROOFING ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood-preservative-treated materials.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Wood preservative treated materials.

a. Lumber.
b. Plywood.

2. Fasteners.

3. Adhesives.

4. Isolation barrier membrane.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

C. Plywood: DOC PS 1, Exterior A-C, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

E. Application: Treat items indicated on Drawings, and the following:

1. Wood nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.

2.3 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Provide fasteners of Type 304 stainless steel.

B. Wood Screws for Attachment of Roof Blocking: Screws complying with ASME B18.6.1. Series 300 stainless steel, non-magnetic, torx or square drive, #10, length as required to provide minimum embedment of 1-1/2-inches into substrate.

C. Screws for Attachment to Metal Deck: Self drilling screws complying with ASME B18.6.1. Series 300 stainless steel, non-magnetic, torx or square drive, #10, 2-1/2-inch length (unless otherwise noted).

D. Screws for Attachment to Steel Angles or Framing: Self drilling screws complying with ASME B18.6.1. Series 300 stainless steel, non-magnetic, #12, 2-1/2-inch length minimum (unless otherwise noted).

1. With Winged Reamers: Wings designed to break off at contact with steel.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency. Anchor expands by tightening or hammering a pin after insertion into pre-drilled hole.

1. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.4 MISCELLANEOUS MATERIALS

A. Adhesives: Low odor, low VOC (less than 2 percent by weight), high-strength polyurethane formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Henkel Corporation; Loctite PL Premium Fast Grab, or a comparable product.

B. Isolation Barrier Membrane: 40-mil-thick, self-adhering sheet consisting of rubberized asphalt laminated to a cross-laminated polyethylene film with release liner on adhesive side.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Carlisle Coatings & Waterproofing, Incorporated; CCW-705, or comparable product.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

B. Set roofing rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit roofing rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

E. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous isolation barrier membrane between wood and metal decking.

3.2 INSTALLATION OF WOOD BLOCKING, NAILERS AND PLYWOOD

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

1. Provide 1/4-inch vent space between each length of blocking.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with recommendations of FM Global Loss Prevention Data Sheet 1-49 and the following:

1. Anchor bottom blocking to steel angles with minimum 3/8-inch stainless steel bolts with washers, at maximum 24 inches on center, or self-drilling screws in two rows, spaced not more than 24 inches on center and 6 inches from ends of blocking lengths.

2. At locations where bottom blocking is to be attached directly to metal decking, provide isolation barrier membrane between deck and blocking, install wrinkle free. Apply primer if required by membrane manufacturer. Use primer rather than nails for installing membrane at low temperatures, overlap edges not less than 3-1/2 inches, roll laps with roller, cover membrane within 14 days. Attach bottom blocking with stainless steel self-drilling screws, penetrating metal decking at least 1 inch in two rows, spaced not more than 24 inches on center and 6 inches from ends of blocking lengths.

3. Attach subsequent blocking to bottom blocking with stainless steel screws, penetrating at least 1-1/4 inches in two rows, spaced not more than 24 inches on center and 6 inches from ends of blocking lengths.

4. Attach plywood to substrate with stainless steel screws spaced at 12 inches on center maximum. Where more than one layer of plywood is being attached, attach subsequent plywood to base layer of plywood/substrate with polyurethane construction adhesive beads spaced at 6 inches on center maximum and stainless-steel screws, penetrating at least 3/4 inch in two rows, spaced not more than 12 inches on center and within 4 inches from end of panel lengths.

5. At outside building corners, locate fasteners at 12 inches on center and 6 inches from corner, unless closer spacing is required to meet minimum 100 lb per fastener withdrawal force in any direction, or to comply with FM 1-49 recommendations.

END OF SECTION 06 10 26

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall and soffit sheathing.
2. Sheathing joint and penetration treatment.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for item listed below, otherwise submit full Product Data for the following:

1. Glass-mat gypsum wall sheathing.
2. Cementitious backer units.

C. Sustainable Design Submittals:

1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
2. Product Data: For installation adhesives, indicating VOC content.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WALL AND SOFFIT SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Gypsum, Saint-Gobain; GlassRoc Sheathing.
    b. Georgia-Pacific Gypsum, LLC; DensGlassSheathing.
    c. USG Corporation; USG Securock Brand Glass-Mat Sheathing.

2. Type and Thickness: Regular, 1/2 inch thick.

B. Cementitious Backer Units: ASTM C1325, Type A.

1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; Durock Brand Cement Board with EdgeGuard, or comparable product.
2. Thickness: 5/8 inch.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

B. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

C. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

D. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in the New York State Building Code.
2. ICC-ES evaluation report for fastener.

E. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

F. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

G. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

H. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.3 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Special Inspections are required for the work of this Section. Refer to Division 01 Section “Quality Requirements” and its attachments.

B. Testing and Inspecting Agency: Owner may engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier and water-resistant glass-mat gypsum sheathing, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include, but not be limited to, the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Compatible materials have been used.
3. All penetrations have been sealed.

D. Tests: As determined by testing agency.

E. Air barriers will be considered defective if they do not pass tests and inspections.

F. Correct damage to air barriers caused by testing; follow manufacturer's written instructions.

END OF SECTION 06 16 00

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior standing and running trim for transparent finish.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.4 SUBMITTALS, GENEARL

A. General: Submit all action submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Shop Drawings:

1. Include the following:

a. Dimensioned plans, elevations, and sections.
b. Attachment details.

2. Show large-scale details.

3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.

B. Samples:

1. Lumber for Transparent Finish (Stain or Clear Finish): Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.

a. Finish: Comply with Division 09 Section “Painting.”

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

B. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.

B. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

2.2 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Architectural Woodwork Standards Grade: Custom.

B. Hardwood Lumber:

1. Species: Red oak.
2. Cut: Plain sliced/plain sawn.
3. Wood Moisture Content: 5 to 10 percent.

2.3 MISCELLANEOUS MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

B. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

1. Verify adhesives have a VOC content of 70 g/L or less.

2.4 FABRICATION

A. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
b. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Install interior architectural woodwork level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.
2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.

1. Secure with countersunk, concealed fasteners and blind nailing.
2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
3. For shop-finished items, use filler matching finish of items being installed.

F. Standing and Running Trim:

1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
2. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary.
3. Scarf running joints and stagger in adjacent and related members.
4. Fill gaps, if any, between top of base and wall with plastic wood filler; sand smooth.
5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

3.3 RESTORATION

A. Restore damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects.
B. Where not possible to restore, replace defective woodwork.
C. Field Finish: See Division 09 Section " Painting" for final finishing of installed interior architectural woodwork.

3.4 CLEANING

A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 06 40 23

SECTION 07 17 00 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bentonite waterproofing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details, installation procedures, testing and inspection procedures, and protection and correction.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, and installation instructions.

1. Granular bentonite.
2. Bentonite mastic.
3. Bentonite tubes.
4. Termination bar.
5. Plastic protection sheet.
6. Cement grout patching material.
7. Masonry fasteners.
8. Sealants.
9. Tapes.
10. Adhesive.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for item listed below, otherwise submit full Product Data for the following:

1. Geotextile/bentonite sheets.
2. Composite polyethylene/bentonite membrane.

C. Shop Drawings: Include installation details for waterproofing, penetrations, and interface with other work.

D. Samples: For each of the following products, in sizes indicated:

1. Waterproofing: 6 inches square.

E. Sample Warranties: For special warranties.

1.6 INFORMATIONAL SUBMITTALS

A. Preconstruction Test Reports: For water samples taken at Project site along with recommendations resulting from these tests.
B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Warranties: Executed special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing on ground water.

1. Obtain water samples from Project site at approximate locations where waterproofing will be installed and test for acids, alkalis, brine, or other contaminants that may inhibit performance of waterproofing materials.

2. Comply with waterproofing manufacturer's written instructions for testing.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit bentonite waterproofing to be installed according to manufacturer's written instructions and warranty requirements.

1. Do not apply waterproofing materials to surfaces where ice or frost is visible. Do not apply bentonite waterproofing materials in areas with standing water.
2. Do not place bentonite clay products on damp surfaces unless such practice is approved in writing by manufacturer.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard warranty in which manufacturer agrees to correct or replace work for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

B. Installer's Special Warranty: Waterproofing Installer’s warranty, covering Work of this Section, including all components of waterproofing system, against failure to remain watertight, and faulty or defective materials and workmanship, in which Installer agrees to correct or replace work, for the following warranty period:

1. Warranty Period: 2 years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Waterproofing System: Obtain waterproofing materials and molded-sheet drainage panels from single source from single manufacturer.

2.2 COMPOSITE POLYETHYLENE/BENTONITE MEMBRANE

A. Composite Polyethylene/Bentonite Membrane: Minimum 90-mil- thick membrane consisting of a polyethylene geomembrane bonded to a layer of bentonite.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CETCO, a Minerals Technologies company; Swelltite.
b. Tremco, Inc., Commercial Sealants and Waterproofing Division; Paraseal.

2. Puncture Resistance: Not less than 70 lbf according to ASTM D4833 or 110 lbf according to ASTM E154.

3. Vapor Permeance: Not greater than 0.03 perms according to ASTM E96/E96M.

2.3 ACCESSORIES

A. Granular Bentonite: Sodium bentonite clay containing a minimum of 90 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a No. 20 sieve.

B. Bentonite Mastic: Bentonite compound of trowelable consistency, specifically formulated for application at joints and penetrations.

C. Bentonite Tubes: Manufacturer's standard 2-inch-diameter, water-soluble tube containing approximately 1.5 lb/ft. of granular bentonite; hermetically sealed; designed specifically for placing on wall footings at line of joint with exterior base of wall.

D. Termination Bar: Extruded-aluminum or formed-stainless-steel bars with upper flange to receive sealant.

E. Plastic Protection Sheet: Polyethylene sheeting according to ASTM D4397; thickness as recommended in writing by waterproofing manufacturer to suit application but at least 6 mils thick.

F. Cement Grout Patching Material: Grout mix compatible with substrate being patched and recommended in writing by waterproofing manufacturer.

G. Masonry Fasteners: Case-hardened nails or hardened-steel, powder-actuated fasteners. Depending on manufacturer's written requirements, provide 1/2- or 1-inch-diameter washers under fastener heads.

H. Sealants: As recommended in writing by waterproofing manufacturer. Comply with requirements specified in Division 07 Section "Joint Sealants."

I. Tapes: Waterproofing manufacturer's recommended waterproof tape for joints between sheets, membranes, or panels.

J. Adhesive: Waterproofing manufacturer's water-based adhesive used to secure waterproofing to both vertical and horizontal surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations and other conditions affecting performance of bentonite waterproofing.

B. Examine bentonite materials before installation. Reject materials that have been prematurely exposed to moisture.

C. Verify that substrate is complete and that work that will penetrate waterproofing is complete and rigidly installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions.

B. Formed Concrete Surfaces: Remove fins and projections. Fill voids, rock pockets, form-tie holes, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

C. Horizontal Concrete Surfaces: Remove debris, standing water, oily substances, mud, and similar substances that could impair the bonding ability of concrete or the effectiveness of waterproofing. Fill voids, cracks greater than 1/8 inch, honeycomb areas, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

3.3 INSTALLATION, GENERAL

A. Prepare substrates, voids, cracks, and cavities; and install waterproofing and accessories according to manufacturer's written instructions.

1. Before installing, verify the correct side of waterproofing that shall face substrate surface.

2. Apply granular bentonite around penetrations in horizontal surfaces and changes in plane according to manufacturer's details in preparation for bentonite tubes and mastic.

3. Apply bentonite tubes, bentonite mastic, or both at changes of plane, construction joints in substrate, projections, and penetrations.

4. Prime concrete substrates. Primer may be omitted on concrete surfaces that comply with manufacturer's written requirements for dryness, surface texture, and freedom from imperfections.

B. Apply bentonite tubes continuously on footing against base of wall to be waterproofed.

C. Protect waterproofing from damage and wetting before and during subsequent construction operations. Correct punctures, tears, and cuts.

3.4 INSTALLATION OF COMPOSITE POLYETHYLENE/BENTONITE MEMBRANE

A. Install a continuous layer of waterproofing membrane, with ends and edges lapped a minimum of 4 inches unless otherwise indicated. Stagger end joints between membranes a minimum of 24 inches. Seal joints with permanent seam tape.

B. Concrete Walls: Apply mastic to form continuous 3/4-inch cant or fillet at intersection of footings and walls.

1. Starting at lowest point, install a layer of waterproofing membrane horizontally, extending a minimum of 6 inches onto the footing. Lap membrane ends and edges a minimum of 2 inches.

2. Secure membrane to wall.

3. Apply mastic to form continuous 3/4-inch layer around penetrations.

4. Termination at Grade: Extend waterproofing membrane to within 2 inches of finish grade unless otherwise indicated. Secure top edge with termination bar. Apply sealant to top edge of termination bar.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed waterproofing installation before covering with other construction, and provide written report stating that installation complies with manufacturer's written instructions.

1. Remove and replace applications of bentonite waterproofing where inspection indicates that it does not comply with specified requirements.

END OF SECTION 07 17 00

SECTION 07 19 00 - WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes penetrating water-repellent treatments for the following vertical surfaces:

1. Clay brick masonry.
2. Natural stone.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's printed statement of VOC content. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

1. Water-based, silane/siloxane-blend, penetrating water repellent.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction Test Reports: For water-repellent-treated substrates.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

1.7 MOCKUPS

A. Prepare mockups of water repellent on each type of substrate required to demonstrate aesthetic effects, for preconstruction testing, and to set quality standards for materials and execution.

1. Locate mockup on existing surfaces where directed by Architect.

    a. Size: 100 sq. ft.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing of water repellents on mockups.

1. In addition to verifying performance requirements, use mockups to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrates.

    a. Test water absorption of mockups using the RILEM tube test method.

2. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.9 FIELD CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions, unless manufacturer’s written instructions require more stringent conditions:

1. Building has been closed in for not less than 30 days before treating wall assemblies.
2. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
3. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
4. Rain or snow is not predicted within 24 hours.
5. Not less than 24 hours have passed since surfaces were last wet.
6. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

A. Water-Based, Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, water-based, silane and siloxane blend with 350 g/L or less of VOCs.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ChemMasters, Inc.; PowerSeal SS Plus.
b. Master Builders Solutions; MasterProtect H 107.
c. Pecora Corporation; Klere Seal 920-W.
d. Tnemec Company Inc.; Chemprobe Coating Systems, Series 633 Prime-A-Pell H2O.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.

1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.

2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.

3. Verify that required reconstruction is complete, cured, and dry before applying water repellent.

B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. New Construction and Reconstruction: Allow cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.

B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions.

C. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

D. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

E. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply coating of water repellent on surfaces to be treated using 15 psi-pressure spray with a fan-type spray nozzle to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.

1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
2. Reapply water repellent until coverage test indicates complete coverage.

3.5 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 19 00

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Glass-fiber blanket.
3. Closed-cell spray polyurethane foam.
4. Insulation for miscellaneous voids.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Adhesive for bonding insulation.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Extruded polystyrene board, Type IV, 25-psi.
2. Extruded polystyrene board, Type VI, 40-psi.
3. Glass-fiber blanket, unfaced.
4. Closed-cell spray polyurethane foam.
5. Insulation for miscellaneous voids.

C. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For closed-cell, spray polyurethane foam insulation.

1.6 QUALITY ASSURANCE

A. Spray Polyurethane Foam Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
B. Identification: Identify product R-values with manufacturer’s markings, or certification, in accordance with requirements of building Code in effect for the Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

   a. DuPont; Styrofoam Brand Square Edge and Cavitymate Plus XPS Foam Insulation (Reduced GWP).
   b. Owens Corning; Foamular NGX 250 and NGX CW25 Extruded Polystyrene (XPS) Insulation (Square Edge).

2. Thermal Resistance: R-value of 5.0 per inch.

3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

B. Extruded Polystyrene Board, Type VI: ASTM C 578, Type VI, 40-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

   a. DuPont; Styrofoam Brand Highload 40 psi Extruded Polystyrene Foam Insulation (Reduced GWP).
   b. Owens Corning; Foamular NGX 400 Extruded Polystyrene (XPS) Rigid Foam Insulation (Square Edge).

2. Thermal Resistance: R-value of 5.0 per inch.

2.2 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

   a. CertainTeed Corporation; Sustainable Insulation Fiber Glass Building.
   b. Owens Corning; EcoTouch Pink Fiberglas Insulation.

2.3 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 2 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

   a. Gaco Western LLC; GacoWallFoam 183M.
   b. Lapolla Industries, Inc.; Foam-Lok 2000-4G.

2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

B. Miscellaneous Materials:

1. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

2. Membrane at Transitions: Provide membrane at transitions in substrate and connections to adjacent elements acceptable to the spray polyurethane foam manufacturer.

3. Thermal Barrier Intumescent Coating: Intumescent water-based, spray-applied coating that has been tested and approved for use in a building interior as a 15-minute alternative thermal barrier complying with New York State Code and New York State VOC regulations. Use only products that have been tested and approved for use with spray polyurethane foam to be used; provide primer as required.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide International Fireproof Technology, Inc.; DC315, or comparable product.

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Spray Polyurethane Foam Insulation for Miscellaneous Voids: ASTM C 1029, Type II, closed cell, minimum density of 1.75 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.0 deg F x h x sq. ft./Btu at 75 deg F, with maximum flame-spread and smoke-developed indexes of 25 and 400, respectively, per ASTM E 84.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont; Froth-Pak Foam Insulation, or comparable product.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

1. Adhesives shall have a VOC content of 70 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the Work.
B. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation, or that interfere with insulation attachment.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

E. Install insulation so that manufacturer’s R-value mark is readily observable, in accordance with requirements of building Code in effect for the Project.

3.3 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge surfaces, set extruded polystyrene board (Type IV, 25-psi) insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

B. On horizontal surfaces, loosely lay extruded polystyrene board (Type VI, 40-psi) insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. Where indicated, install extruded polystyrene board (Type V, 100-psi) insulation units.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt extruded polystyrene board (Type IV, 25-psi) panels together for tight fit.
B. Adhesive Installation: Install with adhesive according to manufacturer's written instructions.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer. Fit courses of extruded polystyrene board (Type IV, 25-psi) insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry."

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Spray Polyurethane Insulation for Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.7 INSTALLATION OF SPRAY FOAM INSULATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

C. Comply with insulation manufacturer's written instructions applicable to products and applications.

D. Prior to application, bridge gaps in construction at changes in substrate plane or changes in adjoining materials as recommended by manufacturer.

E. Spray insulation to envelop entire area to be insulated and fill voids.

F. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer.

3.8 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 24 19 - WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. EIFS-clad drainage-wall assemblies, including EIFS manufacturer's air and water-resistive barrier system, that are field applied over substrate.

1.3 DEFINITIONS

A. Definitions in ASTM E2110 apply to Work of this Section.
B. EIFS: Exterior insulation and finish system(s).
C. Polymer-Based Exterior Insulation and Finish System: Class PB EIFS, as defined in ASTM E2568.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each EIFS component indicated.

1. Air and water-resistive barrier system.
2. Insulation adhesive.
3. Molded, (expanded) rigid cellular polystyrene board insulation.
4. Reinforcing mesh.
5. Base coat.
6. Water-resistant base coat.
7. Primer.
8. Finish coat.
9. Sealer.
10. Trim accessories.

B. Shop Drawings: Include plans, elevations, sections, details of components, details of penetrations and terminations, flashing details, joint locations and configurations, air and water-resistive barrier system details, and connections and attachments to other work.

C. Samples: For each type of finish-coat color and texture indicated.

1. Include similar Samples of exposed accessories involving color selection.

D. Sample Warranties: For special warranties.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by EIFS manufacturer, certifying the following:

1. EIFS complies with requirements.

2. EIFS substrate is acceptable to EIFS manufacturer.

3. Accessory products installed with EIFS, including joint sealants, flashing, air and water-resistive barrier systems, and trim, whether or not furnished by EIFS manufacturer and whether or not specified in this Section, are acceptable to EIFS manufacturer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For EIFS to include in maintenance manuals.
B. Executed Warranties: For special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is currently listed in the AWCI International database, is certified in writing by EIFS manufacturer as qualified to install Class PB EIFS using trained workers, and who has successfully completed a minimum of three comparable projects.

B. Identification: Identify product R-values with manufacturer’s markings, or certification, in accordance with requirements of building Code in effect for the Project.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Stack insulation board flat and off the ground.
2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1.11 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to correct or replace components of EIFS-clad drainage-wall assemblies that fail in materials within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Bond integrity and weathertightness.
   b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.

2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:

   a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
   b. Insulation installed as part of EIFS.
   c. Insulation adhesive.
   d. Air and water-resistive barrier systems.

3. Warranty Period: Minimum 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Dryvit Systems, Inc.
2. Sto Corp.

B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with EIFS components.

2.2 PERFORMANCE REQUIREMENTS

A. EIFS Performance: Comply with ASTM E2568 and with the following:

1. Weathertightness: Resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior.

2. Structural Performance of Assembly and Components:

   a. Wind Loads: As indicated on Drawings.

3. Impact Performance: ASTM E2568, Standard impact resistance unless otherwise indicated.

4. Abrasion Resistance of Finish Coat: Sample consisting of 1-inch-thick EIFS mounted on 1/2-inch-thick gypsum board; cured for a minimum of 28 days and shows no cracking, checking, or loss of film integrity after exposure to 528 quarts of sand when tested according to ASTM D968, Method A.

5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch clean glass substrate; cured for 28 days and shows no growth when tested according to ASTM D3273 and evaluated according to ASTM D3274.

6. Drainage Efficiency: 90 percent average minimum when tested according to ASTM E2273.

2.3 EIFS MATERIALS

A. Air and Water-Resistive Barrier System: EIFS manufacturer's standard formulation and accessories for use as air and water-resistive barrier system; vapor-permeable type; compatible with substrate.

1. Water-Resistance: Comply with physical and performance criteria of ASTM E2570/E2570M.

B. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; specifically formulated to be applied to back side of insulation in a manner that creates open vertical channels designed to serve as an integral part of the water-drainage system of the EIFS-clad drainage-wall assembly; compatible with substrate; and complying with[**one of**] the following:

1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, and polymer-based adhesive specified for base coat.
2. Factory-blended dry formulation of portland cement, dry polymer admixture, and fillers specified for base coat.

C. Molded, (Expanded) Rigid Cellular Polystyrene Board Insulation: Comply with ASTM E2430/E2430M, unless otherwise noted, and the following:

1. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E84.
2. Dimensions: Provide insulation boards of not more than 24 by 48 inches, with thickness indicated on Drawings.
3. Foam Buildouts: Provide with profiles and dimensions indicated on Drawings.

D. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multi end strands with retained mesh tensile strength of not less than 120 lbf/in. according to ASTM E2098/E2098M and the following:

1. Reinforcing Mesh for EIFS, General: Not less than weight required to comply with impact-performance level specified in "Performance Requirements" Article.
2. Detail-Reinforcing Mesh: Not less than 4.0 oz./sq. yd.

E. Base Coat: EIFS manufacturer's standard mixture complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.

2. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.

F. Water-Resistant Base Coat: EIFS manufacturer's standard water-resistant formulation complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.

2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.

G. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

H. Finish Coat: EIFS manufacturer's standard acrylic-based coating complying with the following:

1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
2. Colors: As selected by Architect from manufacturer's full range.
3. Textures: As selected by Architect from manufacturer's full range.

I. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.

J. Water: Potable.

K. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D1784, manufacturer's standard cell class for use intended, and ASTM C1063

2.4 MIXING

A. Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials, except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after surfaces are dry.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.

C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.3 EIFS INSTALLATION, GENERAL

A. Comply with ASTM C1397, ASTM E2511, and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 SUBSTRATE PROTECTION APPLICATION

A. Air and Water-Resistive Barrier System: Apply over sheathing to provide an air and water-resistive barrier.

1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by EIFS manufacturer's written instructions.

3.5 TRIM INSTALLATION

A. Trim: Apply trim accessories as indicated, and as accepted by EIFS manufacturer. Coordinate with installation of insulation.

1. Corner bead for soffit edges.

3.6 INSULATION INSTALLATION

A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C1397 and the following:

1. Apply adhesive to insulation by notched-trowel method, with notches oriented vertically to produce drainage channels that remain functional after the insulation is adhered to substrate.

2. Press and slide insulation into place. Apply pressure over entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.

3. Allow adhered insulation to remain undisturbed for not less than 24 hours, before beginning rasping and sanding insulation or applying base coat and reinforcing mesh.

4. Apply insulation over substrates in courses with long edges of boards oriented horizontally.

5. Begin first course of insulation from a level base line and work upward.

6. Stagger joints of insulation boards in successive courses to produce running bond pattern. Locate joints, so no piece of insulation is less than 12 inches wide or 6 inches high. Offset joints not less than 6 inches from corners of window and door openings and not less than 4 inches from aesthetic reveals.

a. Adhesive Attachment: Offset joints of insulation not less than 6 inches from horizontal and 4 inches from vertical joints in sheathing.

7. Interlock ends at internal and external corners.

8. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.

9. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.

10. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch. Prevent airborne dispersal and immediately collect insulation raspings or sandings.

11. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.

12. Before installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches over front and back face unless otherwise indicated on Drawings.

13. Treat exposed edges of insulation as follows:

    a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.

    b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh. Treat edges as recommended by EIFS manufacturer for proper sealant installation.

3.7 BASE-COAT APPLICATION

A. Base Coat: Apply full coverage to exposed insulation with not less than 1/16-inch dry-coat thickness.

B. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C1397. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.

3.8 FINISH-COAT APPLICATION

A. Primer: Apply over dry base coat.

B. Finish Coat: Apply full-thickness coverage over dry base coat, maintaining a wet edge at all times for uniform appearance, to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.9 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Air and water-resistive barrier systems applied over sheathing.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. EIFS Tests and Inspections: According to ASTM E2359/E2359M.

D. EIFS will be considered defective if it does not pass tests and inspections.

3.10 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION 07 24 19

SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vapor-retarding, fluid-applied air barriers.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

1. Accessory materials.
2. Stainless-steel sheet.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the “As-Specified Verification Form” (attached to Division 01 Section “Submittal Procedures”) for each item listed below, otherwise submit full Product Data for the following:

1. High-build, vapor-retarding air barrier.

C. Sustainable Design Submittals:

1. Product Data: For coatings, indicating VOC content.

D. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.7 INFORMATIONAL SUBMITTALS

A. Product Certificates, Compatibility: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

B. Product Certificates, Fire Propagation Characteristics: From a qualified testing agency, documenting that air barrier system as a component of the indicated wall assembly has been tested and passed NFPA 285.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly 8 feet long by 8 feet high, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

    a. Include junction with roofing membrane and foundation wall intersection.
    b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
B. Protect stored materials from direct sunlight.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
B. VOC Content: 100 g/L or less.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E2357.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

A. High-Build, Vapor-Retarding Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 40 mils or thicker over smooth, void-free substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

    a. Carlisle Coatings & Waterproofing; Fire Resist Barritech NP.
    b. Henry Company; Air-Bloc 16MR.
    c. Meadows, W. R., Inc.; Air-Shield LSR.
    d. Tremco, Inc., Commercial Sealants and Waterproofing Division, an RPM company; ExoAir 130.

2. Physical and Performance Properties:

    a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
    b. Vapor Permeance: Maximum 0.1 perm; ASTM E96/E96M, Desiccant Method.
    c. Ultimate Elongation: Minimum 270 percent; ASTM D412, Die C.
    d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D4541.
    e. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Correct punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond corrected areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness not less than 40 mils.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; correct substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.

2. Air-barrier dry film thickness.

3. Continuous structural support of air-barrier system has been provided.

4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.

5. Site conditions for application temperature and dryness of substrates have been maintained.

6. Maximum exposure time of materials to UV deterioration has not been exceeded.

7. Surfaces have been primed, if applicable.

8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.

9. Termination mastic has been applied on cut edges.

10. Strips and transition strips have been firmly adhered to substrate.

11. Compatible materials have been used.

12. Transitions at changes in direction and structural support at gaps have been provided.

13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.

14. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers or ASTM E1186, chamber depressurization using detection liquids.

2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E783.

3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D4541 for each 600 sq. ft. of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Correct damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after correcting and preparing the overexposed materials according to air-barrier manufacturer's written instructions.

2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 53 23 - EPDM ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered ethylene-propylene-diene-terpolymer (EPDM) roofing system.
2. Roof insulation.
3. Cover board.
4. Walkway pads.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, testing and inspecting agency representative, roofing Installer, roofing Installer’s superintendent, roofing system manufacturer's technical representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress.

4. Examine deck substrate conditions and finishes, including flatness and fastening.

5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.

7. Review temporary protection requirements for roofing system during and after installation.

8. Review building occupancy, safety, HVAC and equipment shut-downs, noise levels and other items that will affect the building occupants and those on or near the site.

9. Review roof observation and repair procedures after roofing installation.

1.5 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals (except field quality-control reports) required by this Section concurrently.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. EPDM sheet.
2. Sheet flashing.
3. Bonding adhesive.
4. Adhesive/primer.
5. Seaming material.
6. Lap sealant.
7. Water cutoff mastic.
8. Metal termination bars.
9. Fasteners.
10. Miscellaneous accessories.
11. Polyisocyanurate board insulation.
12. Tapered insulation.
13. Insulation fasteners.
14. Insulation adhesive.
15. Cover board.
16. Walkway pads.
17. Insulation for miscellaneous voids.

B. Sustainable Design Submittals:

1. Product Data: For applicable adhesives and sealants, indicating VOC content.

C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout, R-values and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation, thickness, R-values and slopes.
5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
6. Walkway pad layout.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

E. Sample Warranties: For manufacturer's special warranties and special Project warranties.

1.7 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, identifying all roof system components and certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of complying with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

B. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.
B. Warranty: Executed special warranties and special Project warranties.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed listed in FM Approvals' RoofNav listed in SPRI's Directory of Roof Assemblies for roofing system identical to that used for this Project.

1. Manufacturer’s Technical Representative: A non-sales technical representative who shall, at a minimum:

a. Participate in the Preinstallation Roofing Conference.

b. Witness start of roofing membrane installation.

c. Inspect the roofing membrane installation when work is approximately 50 percent complete to ascertain that procedures being followed are proper and to determine whether any corrective work will be required.

d. Inspect the roofing membrane installation at completion to determine whether any corrective work will be required prior to issuing the warranty. Notify the Owner and Architect a minimum of 72 hours before said inspection.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty, and has successfully completed a minimum of three similar-sized projects in the last five years.

1. Installer’s Superintendent Qualifications: An experienced superintendent who is trained and approved by roofing system manufacturer, to oversee installation on-site of roofing system at all times roofing work is in progress.

2. Provide adequate number of experienced workers regularly engaged in this type of work who are skilled in the application techniques of the materials specified.

C. Identification: Identify product R-values with manufacturer’s markings, or certification, in accordance with requirements of building Code in effect for the Project.

1.10 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. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

1. Do not install materials that are wet or moisture damaged; remove from Project site.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Proceed with work such that recently completed roof areas are not subjected to construction traffic. Protect recently completed roof areas and inspect for possible damage.

1.12 COORDINATION

A. Coordinate construction operations on or adjacent to roof, included in different Sections, which depend on each other for proper installation, connection, and operation.

1.13 WARRANTY

A. Special Warranty: Manufacturer's total system "edge-to-edge" warranty, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Pro-rated warranties are not acceptable.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
2. Special warranty includes roof specialties specified in Division 07 Section "Roof Specialties."
3. Special warranty includes coverage for wind damage sustained up to wind speed requirements specified in "Performance Requirements" Article.
4. Special warranty includes coverage for hail resistance.
5. Warranty Period: 20 years (Base Bid), 30 years (Alternate) from Date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, and walkway products, against leaks and faulty or defective materials and workmanship, and to repair or replace work, without monetary limitation, for the following warranty period:

1. Warranty Period: 2 years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the Resistance to Foot Traffic Test in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience. Materials shall comply with the Building Code of New York State.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures calculated according to the requirements of the Building Code of New York State, which references ASCE/SEI 7:

1. Wind Speed: As indicated on Drawings.
2. Wind Uplift Pressures: As indicated on Drawings.

D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 MH.

E. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.

F. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 MANUFACTURERS

A. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.3 ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING

A. EPDM Sheet: ASTM D4637/D4637M, Type I, nonreinforced, fire-retardant EPDM sheet.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec Incorporated.
b. Elevate.
c. Johns Manville; a Berkshire Hathaway company.

2. Thickness: 60 mils (Base Bid), 90 mils (Alternate), nominal.

3. Sheet Width: Maximum allowable for applicable installation.

4. Exposed Face Color: Black.

2.4 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants on the interior side of weather barrier shall comply with the following limits for VOC content:

a. Plastic Foam Adhesives: 50 g/L.
b. Panel Adhesives: 50 g/L.
c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Other Adhesives: 250 g/L.
f. Single-Ply Roof Membrane Sealants: 450 g/L.
g. Nonmembrane Roof Sealants: 300 g/L.
h. Sealant Primers for Nonporous Substrates: 250 g/L.
i. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard, low-VOC type.

D. Adhesive/Primer: Manufacturer's standard, low-VOC type.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Carlisle SynTec Incorporated; Cav-Grip III Low-VOC Adhesive/Primer, or comparable product.

E. Membrane Cleaner: Manufacturer’s standard.

F. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch-wide minimum, butyl splice tape with release film.

1. At Contractor’s option, seam tape may be factory-applied type.

G. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

H. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

I. Metal Termination Bars: Manufacturer's standard, predrilled at 6-inch centers aluminum bars, approximately 1 by 1/8 inch thick; with sealant ledge.

1. Fasteners: Series 300 stainless steel drive pin fasteners for masonry substrate embedment, Series 300 stainless steel screw-type fasteners at wood substrate embedment.

J. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to roofing system manufacturer.

1. Fasteners at Wood-Preservative-Treated Lumber: Screws complying with ASME B18.6.1. Series 300 stainless steel, non-magnetic, torx or square drive, #10, length as required to provide minimum embedment of 1-1/2-inches into substrate.

K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by EPDM roof membrane manufacturer, and in compliance with "Performance Requirements" Article.

1. Minimum Total System R-Value: 30.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2, Grade 2, coated glass-fiber mat facer on both major surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec Incorporated; SecurShield Polyiso.
b. Elevate; ISOGARD CG.
c. Johns Manville; a Berkshire Hathaway company; ENRGY 3 CGF.

2. Provide insulation tested as part of an assembly that satisfactorily passes UL 1256.

3. Compressive Strength: 20 psi.

4. Size: 48 by 48 inches, for adhered installation and 48 by 96 inches, for mechanical attachment.

5. Thickness:

a. Base Layer: Not less than 2.4 inches.
b. Upper Layer: Not less than 2.4 inches.

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.

2. Minimum Thickness: 1/2 inch.

3. Slope:

a. Roof Field: 1/4” per foot at new building areas as shown on Drawings.

b. Saddles, Crickets and Primary Drain Sumps: 1/2 inch per foot unless otherwise indicated on Drawings. Typical drain sump dimension is 4’ x 4’, unless otherwise indicated on plan. Provide ‘snub-nose’ saddles and crickets to match width of tapered drain sump as shown on Drawings.

c. Do NOT provide tapered sumps at overflow drain locations.

4. Provide fiber board tapered edge strips to transition from 1/2-inch to 0-inch.

2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Bead-applied, low-rise, multicomponent urethane adhesive.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec Incorporated; FAST Dual Cartridge Adhesive.
b. Elevate; I.S.O. Twin Pack Insulation Adhesive.
c. Johns Manville; a Berkshire Hathaway company; JM Two-Part Urethane Insulation Adhesive.

D. Cover Board: ASTM C1289 Type II, Class 4, Grade 1, 1/2-inch-thick polyisocyanurate, coated glass-mat facer on both major surfaces, with a minimum compressive strength of 80 psi.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec Incorporated; SecurShield HD Polyiso.
b. Elevate; Isogard HD Cover Board.
c. Johns Manville; a Berkshire Hathaway company; ProtectoR HD.

E. Insulation for Miscellaneous Voids:

1. Spray Polyurethane Foam Insulation for Miscellaneous Voids: ASTM C 1029, Type II, closed cell, minimum density of 1.75 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.0 deg F x h x sq. ft./Btu at 75 deg F, with maximum flame-spread and smoke-developed indexes of 25 and 400, respectively, per ASTM E 84.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont; Froth-Pak Foam Insulation, or comparable product.

2. Mineral Wool Insulation for Miscellaneous Voids: Mineral wool batt insulation designed for thermal resistance. ASTM C665, Flame Spread Index = 0, Smoke Developed Index = 0, ASTM E84 (UL 723), Non-Combustible, ASTM E136.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide Rockwool; Comfortbatt Thermal Batt Insulation, or comparable product.

2.7 WALKWAY PADS

A. Walkway Pads: Factory-formed, nonporous, heavy-duty, slip-resisting, self-adhering, molded surface-textured flexible EPDM walkway pads, not less than 0.30-inch thick and acceptable to roofing system manufacturer.

1. Size: Approximately 30 by 30 inches.
2. Color: To match roof membrane.

2.8 ROOF INFORMATION DECALS

A. Roofing manufacturer's roof information decal including the following information clearly printed in permanent ink:

1. Name of roofing manufacturer.
2. Name of roofing installer.
3. Type of roofing system including membrane type and thickness.
4. Date of substantial completion.
5. Manufacturer's project identification number.
6. Roofing system warranty duration.
7. Telephone number for reporting warranty-related questions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that steel roof deck is solid and securely attached.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction or into building interior. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, in compliance with “Performance Requirements” Article assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Insulation Installation, General:

1. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. Make joints between adjacent insulation boards not more than 1/8 inch in width.
3. Fill gaps exceeding 1/8 inch with insulation.
4. Cut and fit insulation within 1/8 inch of nailers, projections, and penetrations.
5. Keep manufacturer's R-value markings readily observable in accordance with building Code in effect for Project.
6. Construct tapered sumps at primary drain locations as shown on Drawings.
7. Do not provide tapered sumps at overflow drain locations.
8. Install fiber board tapered edge strips to transition from 1/2-inch to 0-inch.
9. Trim insulation so that water flow is unrestricted.

D. Installation Directly Over Metal Decking:

1. Mechanically Attached Base Layer: Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.

    a. Locate end joints over crests of decking.

    b. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.

        1) Fasten insulation to resist specified uplift pressure in compliance with "Performance Requirements" Article; minimum quantity: one fastener per 2 square feet at field and perimeter, one fastener per square foot at corners.

        2) Fasten into top flutes only; with fastener length not to exceed elevation of bottom flute.

2. Adhered Upper Layers: Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

    a. Stagger end joints within each layer not less than 24 inches in adjacent rows.

    b. Adhere each layer of insulation to substrate using adhesive in compliance with "Performance Requirements" Article and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

        1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, applied at a maximum of 4 inches on center at all field, perimeter, and corner roof areas, firmly pressing and maintaining insulation in place.

2) When installing the adhesive, do not allow the adhesive installation pattern to exceed the width of the board being installed. Exceeding the width of the roof board may cause an uneven application of the adjacent board due to the rising adhesive. Remove any excess adhesive from adjacent surfaces immediately prior to rising and curing.

3) Walk the boards into the adhesive and roll with a 30-inch wide, 150-pound weighted steel roller to ensure full embedment.

E. Installation Over Concrete, Gypsum or Other Types of Plank Decks:

1. Adhered Base Layer: Thoroughly clean and prime deck surface, install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.

a. Adhere base layer of insulation to concrete, gypsum or plank deck in compliance with "Performance Requirements" Article and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

1) Set insulation in ribbons of bead-applied insulation adhesive, applied at a maximum of 4 inches on center at all field, perimeter, and corner roof areas, firmly pressing and maintaining insulation in place.

2) When installing the adhesive, do not allow the adhesive installation pattern to exceed the width of the board being installed. Exceeding the width of the roof board may cause an uneven application of the adjacent board due to the rising adhesive. Remove any excess adhesive from adjacent surfaces immediately prior to rising and curing.

3) Walk the boards into the adhesive and roll with a 30-inch wide, 150-pound weighted steel roller to ensure full embedment.

2. Adhered Upper Layers: Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

a. Stagger end joints within each layer not less than 24 inches in adjacent rows.

b. Adhere each layer of insulation to substrate using adhesive in compliance with "Performance Requirements" Article and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, applied at a maximum of 4 inches on center at all field, perimeter, and corner roof areas, firmly pressing and maintaining insulation in place.

2) When installing the adhesive, do not allow the adhesive installation pattern to exceed the width of the board being installed. Exceeding the width of the roof board may cause an uneven application of the adjacent board due to the rising adhesive. Remove any excess adhesive from adjacent surfaces immediately prior to rising and curing.

3) Walk the boards into the adhesive and roll with a 30-inch wide, 150-pound weighted steel roller to ensure full embedment.

3.5 INSTALLATION OF COVER BOARDS

A. 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 in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks. Cut or score boards at angle changes to avoid bridging.

2. Cut and fit cover board tight to nailers, projections, and penetrations.

3. Adhere cover board to substrate using adhesive in compliance with "Performance Requirements" Article and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

a. Set cover board in ribbons of bead-applied insulation adhesive, applied at a maximum of 4 inches on center at all field, perimeter, and corner roof areas, firmly pressing and maintaining insulation in place.

b. When installing the adhesive, do not allow the adhesive installation pattern to exceed the width of the board being installed. Exceeding the width of the cover board may cause an uneven application of the adjacent board due to the rising adhesive. Remove any excess adhesive from adjacent surfaces immediately prior to rising and curing.

c. Walk the boards into the adhesive and roll with a 30-inch wide, 150-pound weighted steel roller to ensure full embedment.

3.6 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Thoroughly clean substrate of all debris, projections, and substances detrimental to membrane installation, including stray projections of adhesive.

B. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

C. Unroll roof membrane and allow to relax before installing.

D. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

E. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

F. Bonding Adhesive: Apply 100 percent coverage to substrate and underside of roof membrane at rate required by manufacturer and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeters.

H. Apply roof membrane with side laps shingled with slope of roof deck where possible.

I. Apply pressure to the membrane surface in accordance with manufacturer's instructions to obtain maximum contact between the membrane and substrate.

J. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape.

1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
2. Apply lap sealant and seal exposed edges of roofing terminations.
3. At Contractor's option, use manufacturer's factory-applied seam tape installation system.

K. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

L. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 INSTALLATION OF WALKWAY PADS

A. Walkway pads: Install walkway pads according to manufacturer's written instructions.

1. Install walkway pads at the following locations:

a. Perimeter of each rooftop unit.
b. Top and bottom of each roof access ladder.
c. Roof access doors or windows.
d. Locations indicated on Drawings.
e. As required by roof membrane manufacturer's warranty requirements.

2. Adhere walkway pads to cleaned and primed roof membrane according to roofing system manufacturer's written instructions.

3. Space walkway pads 1 ½" max from each other and 1" min. to field seams.

4. Cut walkway pads around penetrations, field seams, etc. Do not install walk pads over field seams.

3.9 ROOF INFORMATION DECAL INSTALLATION

A. Adhesively attach roofing manufacturer's Roof Information Decal at all roof access points (i.e. inside face of hatches, doors, etc. leading to the roof).

3.10 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
B. Correct or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
C. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, correct substrates, and correct or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Thoroughly clean all roof, interior and ground areas of dust, debris, excess materials and equipment.

D. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 53 23

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copings.
2. Roof-edge specialties
3. Counterflashings.

B. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Installer, and installers whose work interfaces with or affects roof specialties.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section and by Division 07 Section “EPDM Roofing” concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. Copings.
2. Fasteners.
3. Canted roof-edge fascia systems and accessories.
4. One-piece counterflashings.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

D. Samples for Verification: For each type of roof specialty indicated with factory-applied color finishes.

E. Sample Warranty: For manufacturer's special warranty.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: For each type of roof specialty, as required by Division 07 Section "EPDM Roofing" certifying that each item complies with requirements specified in "Performance Requirements" Article.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.
B. Warranty: Executed special warranty.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class and ANSI/SPRI ES-1 tested to specified design pressure.

B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Division 07 Section "EPDM Roofing".

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Division 07 Section “EPDM Roofing”.

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. FM Approvals' Listing: Manufacture and install roof-edge specialties that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested and certified according to ANSI/SPRI ES-1 (Test Methods RE-1, RE-2, and RE-3, as applicable) to comply with the Building Code of New York State which references ASCE/SEI 7, and capable of meeting the wind load design criteria indicated on the Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations 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.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in longest uniform section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec Systems; SecurEdge Continuous Cleat Coping, Provide SecurEdge Double Tapered Coping (double-slope) at locations shown on Drawings.

b. Elevate; Elevate Continuous Cleat Coping", Provide Elevate Double Tapered Coping (double-slope) at locations shown on Drawings.

c. Johns-Manville; Presto-Lock Continuous Cleat Coping, Provide Elevate Double Tapered Coping (double-slope) at locations shown on Drawings.

d. Formed Aluminum Sheet Coping Caps: Aluminum sheet, 0.063 inch thick.

e. Surface: Smooth, flat finish.

f. Finish: Two-coat fluoropolymer.

g. Color: As selected by Architect from manufacturer's full range.

2. Corners: Factory mitered and continuously welded, not less than 2 feet long in each direction.

3. Coping-Cap Attachment Method: Snap-on.

a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, not less than 0.040 inch thick (20 gage), 12 inches wide, with integral cleats and factory-applied stainless steel spring clips.

2.3 ROOF-EDGE SPECIALTIES

A. Canted Roof-Edge Fascia: Manufactured, roof-edge fascia system with a snap-on metal fascia cover in longest uniform section lengths not exceeding 12 feet. Provide matching corner units.

1. Provide one of the following types of canted roof-edge fascia systems to meet wind speed requirements or to comply with roofing system manufacturer's warranty requirements:

a. Two-Piece Canted Roof-Edge Fascia: Two-piece fascia system with a continuous formed galvanized steel sheet cant, 0.028 inch thick (24 gage), minimum, with extended vertical leg terminating in a drip edge cleat.

1) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a) Carlisle SynTec Systems; SecurEdge 200 Fascia System.
b) Firestone Building Products Company, LLC; EdgeGard +.
c) Johns Manville; Fascia System 200.

b. Three-Piece Canted Roof Edge Fascia: Three-piece fascia system with a continuous extruded aluminum anchor bar with extended vertical leg terminating in a drip edge cleat and continuous formed galvanized steel sheet canted waterdam, 0.028 inch thick (24 gage), minimum.

1) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a) Carlisle SynTec Systems; SecurEdge 2000 Canted Fascia.
b) Firestone Building Products Company, LLC; AnchorGard Canted Fascia.
c) Johns Manville; Presto-Tite Canted Fascia.

2. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, not less than 0.050 inch thick and as required to meet performance requirements.

a. Surface: Smooth, flat finish.

3. Corners: Factory mitered and continuously welded, not less than 2 feet long in each direction.

4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

B. Aluminum Finish: Two-coat fluoropolymer as selected by Architect.

1. Color: As selected by Architect from manufacturer's standard range.

2.4 COUNTERFLASHINGS

A. One-Piece Counterflashings: Manufactured units formed of single counterflashing sections.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec Systems; SecurEdge Counter Flashing 1 Pc. Reglet.
b. Firestone Building Products Company, LLC; 1 Piece Counter Flashing Reglet Version.
c. Metal-Era LLC; 1 Piece Counter Flashing Reglet Version.

2. Formed Aluminum: Not less than 0.050 inch thick.

a. Surface: Smooth, flat finish.

3. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in longest uniform section lengths not exceeding 12 feet and compress against base flashings with joints lapped.

a. Reglet Type: For embedment in masonry mortar joints.

B. Aluminum Finish: Two-coat fluoropolymer as selected by Architect.

1. Color: As selected by Architect from manufacturer's standard range.

2.5 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.
B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
C. Aluminum Extrusions: ASTM B221, alloy and temper recommended by manufacturer for type of use and finish indicated.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Not permitted.
2. Fasteners for Aluminum: Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C920, elastomeric polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Aluminum Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
B. Examine walls, parapets, and roof edges for suitable conditions for roof specialties.
C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
D. Proceed with installation only after unsatisfactory conditions have been corrected.
E. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of sealant.

3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by installing over EPDM roof membrane or self-adhering sheet underlayment to create a permanent separation as recommended by manufacturer.

1. Underlayment: Where installing metal directly on cementitious or wood substrates, install a course EPDM roof membrane or of self-adhering sheet underlayment.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 24 inches of corners or intersections unless otherwise indicated on Drawings.

2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

3. Loose-nail fascia extender at center of pre-punched slotted hole; do not draw nail tight.

4. Stagger joints in fascia from those in fascia extender by not less than 24 inches.

D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 INSTALLATION OF COPINGS

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.

3.4 INSTALLATION OF ROOF-EDGE SPECIALITIES

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
C. Install roof-edge fascia similar to Carlisle Detail Q-1A.1 or Elevate Detail RE-9 and as shown on Drawings, other details are not acceptable.
D. Strip-in cleat as indicated on Drawings.

3.5 INSTALLATION OF COUNTERFLASHINGS

A. Coordinate installation of counterflashings with installation of base flashings and masonry work.

B. Reglets: Install reglets to receive flashings where flashing with embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.

C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.6 CLEANING AND PROTECTION

A. Clean and neutralize flux materials. Clean off excess sealants.

B. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

C. Replace roof specialties that have been damaged or that cannot be successfully restored by finish touchup or similar minor restoration procedures.

END OF SECTION 07 71 00

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

C. Product Schedule: For each penetration firestopping system. Include type of penetration, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.6 INFORMATIONAL SUBMITTALS

A. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines.

1.7 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.

1) UL in its online directory "Product iQ."

2.3 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems are to be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. RectorSeal, a CSW Industrials company.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479.

1. F-Rating: Not less than the fire-resistance rating of the wall penetrated.
2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of the floor penetrated.

2. T-Rating: At least one hour, but not less than the fire-resistance rating of the floor. The following floor penetrations do not require a T-rating:

a. Those within the cavity of a wall.
b. Floor, tub, or shower drains within a concealed space.
c. 4-inch or smaller metal conduit penetrating directly into metal-enclosed electrical switchgear.

3. W-Rating: Provide penetration firestopping systems with a Class 1 W-rating in accordance with UL 1479.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

1. Verify sealant has a VOC content of 250 g/L or less.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.4 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric strips for use around combustible penetrants.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Compressible, removable, and reusable intumescent pillows encased in fire-retardant polyester or glass-fiber cloth. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

K. Fire-Rated Cable Sleeve Kits: Complete kits designed for new or existing cable penetrations through walls to accept standard accessories.

L. Thermal Wrap: Flexible protective wrap tested and listed for up to 2-hour fire ratings in accordance with ASTM E814/UL 1479 for membrane penetrations or ASTM E1725/UL 1724 for thermal barrier and circuit integrity protection.

M. Fire-Rated Cable Pathways: Single or gangable device modules composed of a steel raceway with integral intumescent material and requiring no additional action in the form of plugs, twisting closure, putty, pillows, sealant, or otherwise to achieve fire and air-leakage ratings.

N. Retrofit Device for Cable Bundles: Factory-made, intumescent, collar-like device for firestopping existing over-filled cable sleeves and capable of being installed around projecting sleeves and cable bundles.

O. Wall-Opening Protective Materials: Intumescent, non-curing putty pads or self-adhesive inserts for protection of electrical switch and receptacle boxes.

P. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestop gasket for use around rectangular steel HVAC ducts without fire dampers.

Q. Firestop Plugs: Flexible, re-enterable, intumescent, foam-rubber plug for use in blank round openings and cable sleeves.

R. Fire-Rated Cable Grommet: Molded two-piece grommet made of plenum-grade polymer and foam inner core for sealing small cable penetrations in gypsum walls up to 1/2 inch diameter.

S. Closet Flange Gasket: Molded, single-component, flexible, intumescent gasket for use beneath a water closet (toilet) flange in floor applications.

T. Endothermic Wrap: Flexible, insulating, fire-resistant, endothermic wrap for protecting membrane penetrations of utility boxes, critical electrical circuits, communications lines, and fuel lines.

2.5 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION OF PENETRATION FIRESTOPPING SYSTEMS

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Special Inspections are required for the work of this Section. Refer to Division 01 Section “Quality Requirements” and its attachments.

1. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to UL system numbers in its online directory "Product iQ" under product Category XHEZ.

B. For each location where a penetration occurs, provide a firestopping system selected from the floor and wall system below that complies with this Section and is suitable for the penetration conditions indicated for the Project.

FLOOR Firestopping Systems Listed Using the Alpha-Alpha-Numeric Identification System Published in UL's *Fire Resistance Directory*, Vols. 2a - 2b				
TYPE OF PENETRANT	FLOOR PENETRATION SYSTEMS (First Alpha Component = C or F)			
	Concrete Floors with a Minimum Thick-ness Less Than or Equal to 5 Inches (127 MM)	Concrete Floors with a Minimum Thick-ness OF MORE Than 5 Inches (127 MM)	Framed Floors	Floor-ceiling assem-blies consisting of concrete with mem-brane protection
NO PENETRATING ITEMS	C-AJ-0001-0999 or F-A-0001-0999	C-BJ-0001-0999 or F-B-0001-0999	F-C-1001-1999	
METALLIC PIPE, CONDUIT, OR TUBING	C-AJ-1001-1999 or F-A-1001-1999	C-BJ-1001-1999, C-BK-1001-1999, or F-B-1001-1999	F-C-1001-1999	F-E-1001-1999
NONMETALLIC PIPE, CONDUIT, OR TUBING	C-AJ-2001-2999 or F-A-2001-2999	C-BJ-2001-2999, C-BK-2001-2999, or F-B-2001-2999	F-C-2001-2999	F-E-2001-2999
ELECTRICAL CABLES	C-AJ-3001-3999 or F-A-3001-3999	C-BJ-3001-3999, C-BK-3001-3999, or F-B-3001-3999	F-C-3001-3999	F-E-3001-3999
CABLE TRAYS WITH ELECTRICAL CABLES	C-AJ-4001-4999 or F-A-4001-4999	C-BJ-4001-4999 or F-B-4001-4999		
INSULATED PIPES	C-AJ-5001-5999 or	C-BJ-5001-5999, C-BK-5001-5999,	F-C-5001-5999	F-E-5001-5999

FLOOR Firestopping Systems Listed Using the Alpha-Alpha-Numeric Identification System Published in UL's *Fire Resistance Directory*, Vols. 2a - 2b				
TYPE OF PENETRANT	FLOOR PENETRATION SYSTEMS (First Alpha Component = C or F)			
	Concrete Floors with a Minimum Thick-ness Less Than or Equal to 5 Inches (127 MM)	Concrete Floors with a Minimum Thick-ness OF MORE Than 5 Inches (127 MM)	Framed Floors	Floor-ceiling assem-blies consisting of concrete with mem-brane protection
	F-A-5001-5999	or F-B-5001-5999		
MISCELLANEOUS ELECTRICAL PENETRANTS	C-AJ-6001-6999 or F-A-6001-6999	C-BJ-6001-6999		
MISCELLANEOUS MECHANICAL PENETRANTS	C-AJ-7001-7999 or F-A-7001-7999	C-BJ-7001-7999 or F-B-7001-7999	F-C-7001-7999	F-E-7001-7999
GROUPINGS OF PENETRATIONS	C-AJ-8001-8999 or F-A-8001-8999	C-BJ-8001-8999 or F-B-8001-8999	F-C-8001-8999	F-E-8001-8999

WALL Firestopping Systems Listed Using the Alpha-Alpha-Numeric Identification System Published in UL's *Fire Resistance Directory*, Vols. 2a - 2b				
TYPE OF PENETRANT	Wall PENETRATION SYSTEMS (First Alpha Component = C or W)			
	Concrete or Masonry Walls with a Minimum Thickness Less Than or Equal to 8 Inches (203 MM)	Concrete or Masonry Walls with a Minimum Thickness OF MORE Than 8 Inches (203 MM)	Framed Walls	Composite panel walls
NO PENETRATING ITEMS	C-AJ-0001-0999, C-BJ-0001-0999, or W-J-0001-0999		W-L-000-1-0999	
METALLIC PIPE, CONDUIT, OR TUBING	C-AJ-1001-1999, C-BJ-1001-1999, or W-J-1001-1999	C-BK-1001-1999 or W-K-1001-1999	W-L-1001-1999	W-N-1001-1999
NONMETALLIC PIPE, CONDUIT, OR TUBING	C-AJ-2001-2999, C-BJ-2001-2999, or W-J-2001-2999	C-BK-2001-2999 or W-K-2001-2999	W-L-2001-2999	W-N-2001-2999
ELECTRICAL CABLES	C-AJ-3001-3999, C-BJ-3001-3999, or W-J-3001-3999	C-BK-3001-3999 or WK-3001-3999	W-L-3001-3999	
CABLE TRAYS WITH ELECTRICAL CABLES	C-AJ-4001-4999, C-BJ-4001-4999, or W-J-4001-4999	W-K-4001-4999	W-L-4001-4999	

WALL Firestopping Systems Listed Using the Alpha-Alpha-Numeric Identification System Published in UL's *Fire Resistance Directory*, Vols. 2a - 2b				
TYPE OF PENETRANT	Wall PENETRATION SYSTEMS (First Alpha Component = C or W)			
	Concrete or Masonry Walls with a Minimum Thickness Less Than or Equal to 8 Inches (203 MM)	Concrete or Masonry Walls with a Minimum Thickness OF MORE Than 8 Inches (203 MM)	Framed Walls	Composite panel walls
INSULATED PIPES	C-AJ-5001-5999, C-BJ-5001-5999, or W-J-5001-5999	C-BK-5001-5999	W-L-5001-5999	W-N-5001-5999
MISCELLANEOUS ELECTRICAL PENETRANTS	C-AJ-6001-6999, C-BJ-6001-6999, or W-BJ-6001-6999		W-L-6001-6999	
MISCELLANEOUS MECHANICAL PENETRANTS	C-AJ-7001-7999, C-BJ-7001-7999, or W-J-7001-7999		W-L-7001-7999	W-N-7001-7999
GROUPINGS OF PENETRATIONS	C-AJ-8001-8999, C-BJ-8001-8999, or W-J-8001-8999		W-L-8001-8999	

END OF SECTION 07 84 13

SECTION 07 84 43 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1.6 INFORMATIONAL SUBMITTALS

A. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines.

1.7 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with Listed System Designs published by a qualified testing agency.

1) UL in its online directory "Product iQ."

2.3 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems must accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

1. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.

2. Provide products that, upon curing, do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.

3. Provide firestop products that do not contain ethylene glycol.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. RectorSeal, a CSW Industrials company.

B. Intumescent Gypsum Wall Framing Gaskets (Applied to Steel Tracks, Runners and Studs prior to Framing Installation): Provide products with fire, smoke, and acoustical ratings that allow movement up to 100 percent compression and/or extension in accordance with UL 2079 or ASTM E1966; have an L Rating less than 1 cfm/ft. in accordance with UL 2079; and a minimum Sound Transmission Class (STC) rating of 56 in accordance with ASTM E90 or ASTM C919.

C. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

D. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.

1. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

2.4 ACCESSORIES

A. Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.

2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Apply a suitable bond-breaker to prevent three-sided adhesion in applications where this condition occurs, such as the intersection of a gypsum wall to floor or roof assembly where the joint is backed by a steel ceiling runner or track.

3.3 INSTALLATION

A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. from end of wall and at intervals not exceeding 30 ft.

B. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Special Inspections are required for the work of this Section. Refer to Division 01 Section “Quality Requirements” and its attachments.

1. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's online directory "Product iQ" under product Category XHBN.

B. Head-of-Wall, Fire-Resistive Joint Firestopping Systems:

1. UL-Classified Systems:

a. Basis-of-Design:

1) HW-D-0045
2) HW-D- 0081.

2. Assembly Rating: 1 hour 2 hours.

3. Nominal Joint Width: As indicated.

4. Movement Capabilities: Class II - percent compression or extension.

END OF SECTION 07 84 43

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Mildew-resistant joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.
5. Preformed joint seals.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

1. Cylindrical sealant backings.
2. Bond-breaker tape.
3. Primers.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Silicone joint sealants.
2. Mildew-resistant joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.
5. Preformed joint seals.

C. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.

E. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

F. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.

1.5 MOCKUPS

A. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content: Sealants and sealant primers shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous surfaces shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range. Multiple colors may be selected.

2.2 SILICONE JOINT SEALANTS

A. Silicone Joint Sealants: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); DOWSIL790 Silicone Building Sealant.
b. GE/Momentive Performance Materials Inc.; SCS2700 SilPruf LM.
c. Pecora Corporation; 890NST.
d. Tremco Incorporated; Spectrem 1.

2. Joint-Sealant Application: Joints in vertical surfaces.

a. Exterior Joint Locations:

1) Construction joints in cast-in-place concrete.
2) Joints between cast stone units.
3) Control and expansion joints in unit masonry.
4) Joints in exterior finish systems.
5) Joints between different materials listed above.
6) Perimeter joints between materials listed above and frames of exterior openings.
7) Other joints as indicated.

b. Interior Joint Locations:

1) Control and expansion joints on exposed interior surfaces of exterior walls.
2) Perimeter joints of exterior openings.
3) Other joints as indicated.

2.3 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone Joint Sealants, Mildew Resistant: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); DOWSIL786 Silicone Sealant.
b. GE/Momentive Performance Materials Inc.; SCS1700 Sanitary.

2. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces.

a. Joint Sealant Location:

1) Tile control and expansion joints where indicated.
2) Other joints as indicated.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex Joint Sealants: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; AC-20 +Silicone.
b. Tremco Incorporated; Tremflex 834.

2. Joint-Sealant Application: Interior joints in vertical surfaces not subject to significant movement.

a. Joint Locations:

1) Vertical joints on exposed surfaces of interior unit masonry concrete gypsum board.
2) Perimeter joints between interior wall surfaces and frames of openings.
3) Other joints as indicated.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealants for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Grabber Construction Products; Grabber Acoustical Sound Sealant.
b. Pecora Corporation; AC-20 FTR.
c. USG Corporation; Sheetrock Brand Acoustical Sealant.

2.6 PREFORMED JOINT SEALS

A. Preformed Joint Seals: Manufacturer's standard pre-compressed, elastomeric-coated foam preformed joint seal, for non-invasive installation in joint of nominal joint width as indicated on Drawings, with plus 50 percent and minus 50 percent movement capability.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. EMSEAL Joint Systems, Ltd; Seismic Colorseal.
b. Nystrom, Inc.; Seismic Compression Seal.
c. Watson Bowman Acme Corp.; a BASF affiliate; WaboSeismicWeatherSeal.

2. Joint-Seal Application: Exterior joints in vertical surfaces.

a. Joint Locations:

1) 1" expansion joints.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material) or either of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. Stud Partition Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.5 INSTALLATION OF PREFORMED JOINT SEALS

A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Installation of Preformed Joint Seals:

1. Install each length of seal immediately after removing protective wrapping.
2. Firmly secure compressed joint seals to joint gap side to obtain full bond as recommended by manufacturer.
3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

3.6 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.7 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and correct damaged or deteriorated joint sealants immediately so installations with corrected areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 07 95 13.13 - INTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes interior expansion joint cover assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, accessories, and finishes for expansion joint cover assemblies.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the “As-Specified Verification Form” (attached to Division 01 Section “Submittal Procedures”) for each item listed below, otherwise submit full Product Data for the following:

1. Glide-plate floor joint covers recessed for finish flooring.
2. Elastomeric-seal wall joint covers.
3. Elastomeric-seal acoustical ceiling joint covers.

C. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

D. Samples: For each type of exposed finish.

1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric-seal material.

E. Expansion Joint Cover Assembly Schedule: Include the following information in tabular form:

1. Manufacturer and model number for each expansion joint cover assembly.
2. Expansion joint cover assembly location cross-referenced to Drawings.
3. Nominal joint width.
4. Materials, colors, and finishes.
5. Fire-resistance ratings.

1.6 INFORMATIONAL SUBMITTALS

A. Engineering Judgments: Where Project conditions require modification to a particular fire-resistance-rated interior expansion joint assembly condition shown in the Drawings, submit illustration, with modifications marked, approved by fire-resistance-rated interior expansion joint assembly manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

C. Source Limitation: Obtain expansion control systems from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E1966 by a qualified testing agency.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.

2.3 FLOOR EXPANSION JOINT COVERS

A. Glide-Plate Floor Joint Cover Recessed for Finish Flooring: Assembly consisting of center plate that slides in and out of slots in metal frames fixed to sides of joint gap, recessed to accept finish flooring.

1. Floor-to-Floor Type EJ:

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1) Balco; a CSW Industrials Company; (Glide Plate) 6000 Series, 6FTP-1m.
2) Construction Specialties, Inc.; Allway Metal ALR-100.
3) MM Systems Corporation; Classic Cover System HFXR-1-1.

b. Nominal Joint Width: One inch.

c. Fire-Resistance Rating: Not less than that of adjacent construction.

d. Exposed Metal:

1) Aluminum: Mill.

2.4 WALL EXPANSION JOINT COVERS

A. Elastomeric-Seal Wall Joint Cover: Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.

1. Wall-to-Wall Type EJ:

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1) Balco; a CSW Industrials Company; Elastomeric Seal Series, 75FWG-1.
2) Construction Specialties, Inc.; Flush Thinline FWF-100.
3) MM Systems Corporation; Flushline System FSW-100.

b. Nominal Joint Width: One inch.

c. Fire-Resistance Rating: Not less than that of adjacent construction.

d. Exposed Metal:

1) Aluminum: High-performance organic finish.

a) Color: As selected by Architect from full range of industry colors and color densities.

e. Seal: Preformed elastomeric membranes or extrusions.

1) Color: As selected by Architect from manufacturer's full range.

2. Wall-to-Corner Type EJ:

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1) Balco; a CSW Industrials Company; Elastomeric Seal Series, 75FWGC-1.
2) Construction Specialties, Inc.; Flush Thinline FWFC-100.
3) MM Systems Corporation; Flushline System FSWL-100.

b. Nominal Joint Width: One inch.

c. Fire-Resistance Rating: Not less than that of adjacent construction.

d. Exposed Metal:

1) Aluminum: High-performance organic finish.

a) Color: As selected by Architect from full range of industry colors and color densities.

e. Seal: Preformed elastomeric membranes or extrusions.

1) Color: As selected by Architect from manufacturer's full range.

2.5 CEILING EXPANSION JOINT COVERS

A. Elastomeric-Seal Acoustical Ceiling Joint Cover: Elastomeric-seal assembly designed for use in acoustical ceilings.

1. Ceiling-to-Wall Type EJ:

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1) Balco; a CSW Industrials Company; Face Seal System, ACL-1.
2) Construction Specialties, Inc.; Flush Thinline HCW-100.

b. Nominal Joint Width: One inch.

c. Exposed Metal:

1) Aluminum: Mill.

d. Seal: Preformed elastomeric membranes or extrusions.

1) Color: As selected by Architect from manufacturer's full range

2.6 MATERIALS

A. Aluminum: ASTM B221, Alloy 6063-T5 for extrusions; ASTM B209, Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.

D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

B. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

2.8 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.

1. Provide where indicated on Drawings.

B. Manufacturer's stainless-steel attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.

1. Correct or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.

2. Install frames in continuous contact with adjacent surfaces.

    a. Shimming is not permitted.

3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.

4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.

5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.

6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

G. Moisture Barrier Drainage: If indicated, provide drainage fittings and connect to drains.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Special Inspections are required for the work of this Section. Refer to Division 01 Section “Quality Requirements” and its attachments.
B. Where deficiencies are found or fire barriers are damaged or removed due to testing, correct or replace installations to comply with requirements.
C. Proceed with enclosing fire barriers of interior expansion joint cover assemblies only after inspection reports are issued and installations comply with requirements.

3.5 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION 07 95 13.13

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to ANSI/SDI A250.8. (Nominal gage equivalents are listed in parentheses.)

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals (except field quality-control reports) required by this Section and by Division 08 Sections “Door Hardware” and “Glazing” concurrently.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

1. Interior standard steel doors and frames.
2. Borrowed lights.
3. Frame anchors.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing. Indicate which side of each door or frame has a removable stop.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Field quality control reports.

1.8 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ceco Door; ASSA ABLOY.
2. Curries Company; ASSA ABLOY.
3. Pioneer Industries.
4. Steelcraft; an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At all interior locations .

1. Doors:

a. Type: As indicated in the Door and Frame Schedule.

b. Thickness: 1-3/4 inches.

c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch (18-gage).

d. Edge Construction: Model 2, Seamless, continuously welded seam dressed smooth.

e. Edge Bevel: Bevel lock edge 1/8 inch in 2 inches.

f. Core: Vertical steel stiffener. Fill space between stiffeners with glass- or mineral-fiber insulation.

g. Fire-Rated Core: Manufacturer's vertical steel stiffener, with space between stiffeners filled with glass- or mineral-fiber insulation or laminated mineral board core for fire-rated and temperature-rise-rated doors.

2. Frames:

a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (16-gage).
b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Full profile welded in factory.

3. Exposed Finish: Prime.

2.4 BORROWED LITES

A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch (16-gage).

B. Construction: Full profile welded in factory.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.

2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.

3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

E. Glazing: Comply with requirements in Division 08 Section "Glazing" and with hollow-metal manufacturer's requirements.

2.7 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.

3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.

4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make restored area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.

    b. Install frames with removable stops located on secure side of opening.

    c. Field apply corrosion-resistant coating to backs of frames that will be filled with grout containing antifreezing agents.

    d. Install door silencers in frames before grouting.

2. Fire-Rated Openings: Install frames according to NFPA 80.

3. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.

5. Masonry Walls: Solidly fill space between frames and masonry with mineral-fiber insulation.

6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow-metal manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

   1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.

C. Correct or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect corrected or replaced installations to determine if replaced or corrected door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.5 RESTORATION

A. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 08 11 13

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section and by Division 08 Sections "Door Hardware" and "Glazing" concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction.
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Factory-finishing specifications.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating product contains no urea formaldehyde.
2. Product Data: For composite wood products, indicating product contains no urea formaldehyde.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, light and louver cutouts, and glazing thicknesses.
3. Dimensions and locations of blocking for hardware attachment.
4. Dimensions and locations of mortises and holes for hardware.
5. Clearances and undercuts.
6. Requirements for veneer matching.
7. Doors to be factory finished and application requirements.

D. Samples:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

E. Sample Warranty: For special warranty.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Special warranties.
B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.
B. Package doors individually in plastic bags or cardboard cartons.
C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and temperature and relative humidity are maintained at levels designed for building occupants for the remainder of construction period.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to correct or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to correction or replacement of defective doors.

3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.

1. The Contract Documents contain requirements that may be more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

B. Adhesives: Do not use adhesives that contain urea formaldehyde.

C. Composite Wood Products: Products shall be made without urea formaldehyde.

2.3 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to:

    a. Marshfield-Algoma by Masonite Architectural.
    b. Oshkosh Door Company.
    c. VT Industries, Inc.

2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.

3. ANSI/WDMA I.S. 1A Grade: Premium.

4. Faces: Single-ply, wood veneer not less than 1/50 inch thick.

    a. Species: Red oak.
    b. Cut: Quarter sliced.
    c. Match between Veneer Leaves: Book match.
    d. Assembly of Veneer Leaves on Door Faces: Center-balance match.
    e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

5. Exposed Vertical and Top Edges: Same species as faces - Architectural Woodwork Standards edge Type A.

    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.

    b. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

    c. Fire-Rated Pairs of Doors: Provide formed-steel edges and astragals with intumescent seals.

        1) Finish steel edges and astragals with baked enamel.

    d. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

        1) Screw-Holding Capability: 550 lbf in accordance with WDMA T.M. 10.

6. Core for Non-Fire-Rated Doors:

    a. WDMA I.S. 10 structural composite lumber.

        1) Screw Withdrawal, Door Face: 550 lbf.
        2) Screw Withdrawal, Vertical Door Edge: 550 lbf.

7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

    a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.

8. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. ANSI/WDMA I.S. 1A Grade: Premium.
2. Finish: ANSI/WDMA I.S. 1A TR-8 UV Cured Acrylated Polyester/Urethane
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors in accordance with NFPA 80.
2. Install smoke- and draft-control doors in accordance with NFPA 105.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

C. Correct or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect corrected or replaced installations to determine if replaced or corrected door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be corrected or refinished if Work complies with requirements and shows no evidence of correction or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes access doors and frames for walls.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details material descriptions, dimensions of individual components and profiles, and finishes.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. Stainless-steel flush access doors with exposed flanges.

C. Product Schedule: For access doors and frames.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality control reports.

1.6 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

A. Stainless-Steel Flush Access Doors with Exposed Flanges:

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

a. Karp Associates, Inc.; Model DSC-214M Universal Flush Access Door.
b. Nystrom, Inc.; NT Architectural Access Door.

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.

3. Locations: Walls, where indicated on Drawings and, if not indicated, as follows:

a. In painted CMU exposed to view.
b. In painted gypsum board or plaster exposed to view.
c. In ceramic tile exposed to view.
d. In corrosive environments (i.e., natatorium, pool mechanical room) exposed to view.

4. Door Size: 12” X 12” unless otherwise indicated.

5. Stainless Steel Sheet for Door: Not less than nominal 0.062 inch (16 gage), ASTM A480/A480M No. 4 finish.

6. Frame Material: Same material, thickness, and finish as door.

7. Latch and Lock: Cam latch, screwdriver operated with interior release.

2.3 MATERIALS

A. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.
B. Stainless Steel Flat Bars: ASTM A666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.
C. Frame Anchors: Same material as door face.
D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Stainless Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2. Intermediate Polished Finish: ASTM A480/A480M No. 3.

3. Polished Finish: ASTM A480/A480M No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 31 13

SECTION 08 33 13 - COILING COUNTER DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-rated counter door assemblies.

B. Products Installed but not Furnished under This Section:

1. Steel support framing.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling counter door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic closing device and testing and resetting instructions.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Fire-rated counter door assemblies.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, mounting details, and attachments to other work.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Show locations of controls, locking devices, detectors, and other accessories.
5. Include diagrams for power, signal, and control wiring.

D. Samples: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

E. Sample Warranty: For special warranty.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coiling counter doors to include in maintenance manuals.
B. Warranty: Executed special warranty.
C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for installation of units required for this Project.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to correct or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Failure of components or operators before reaching required number of operation cycles.
c. Faulty operation of hardware.
d. Deterioration of metals, metal finishes, and other materials.

2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

1. Obtain operators and controls from coiling counter door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Complying with NFPA 80; listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1. Smoke Control: In corridors and smoke barriers, provide doors that are listed and labeled with the letter "S" on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784; with maximum air-leakage rate of 3.0 cfm/sq. ft. of door opening at 0.10 inch wg for both ambient and elevated temperature tests.

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design," ICC A117.1, and building Code in effect for Project.

2.3 FIRE-RATED COUNTER DOOR ASSEMBLY

A. Fire-Rated Counter Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

a. Clopay Building Products Co.; Model CERC11 Smoke Resistant Rolling Counter Fire Doors.
b. CornellCookson, LLC; Model ERC11 SmokeShield Rolling Counter Fire Shutters.
c. Wayne Dalton; FireStar Model 550 Fire-Rated Counter Shutters.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000 operating cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Fire Rating: 3/4 hour with smoke control.

D. Door Curtain Material: Stainless steel.

E. Door Curtain Slats: Flat profile slats of 1-1/2- to 2-inch center-to-center height.

1. Thickness: Not less than nominal sheet thickness (coated) 0.034 inch (22 gage) galvanized steel] 0.0312 inch (22 gage) stainless steel; and as required to meet performance requirements.

F. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.

G. Hood: Stainless steel.

1. Thickness: Not less than nominal sheet thickness (coated) 0.028 inch (24 gage) galvanized steel and 0.025 inch (24 gage) stainless steel.
2. Mounting: Face of wall.

H. Sill Configuration: Fire-rated counter.

1. High-Pressure Decorative Laminate At Main Office: As selected by Architect from manufacturer's full range
2. Stainless Steel at Dish Room.

I. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from outside only, with cylinder.

J. Electric Door Operator:

1. Usage Classification: Light duty, up to 10 cycles per day.

2. Operator Location: Concealed tubular.

3. Motor Exposure: Interior] and Exterior, wet, and humid.

4. Motor Electrical Characteristics:

a. Horsepower: 1/2 hp.
b. Voltage: 115-V ac, single phase, 60 Hz.

5. Emergency Manual Operation: Crank type.

6. Obstruction-Detection Device: Wireless safety edge option.

7. Control Station(s): Location as directed by Owner.

8. Other Equipment: Audible and visual signals.

K. Curtain Accessories: Equip door with smoke seals and automatic closing device.

L. Door Finish:

1. Powder-Coated Finish (at Main Office): Color as selected by Architect from manufacturer's full range.
2. Stainless Steel Finish (at Dish Room): ASTM A480/A480M No. 4 (polished directional satin).

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND FABRICATION

A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) as indicated; and as required to meet performance requirements.

2. Stainless Steel Door Curtain Slats: ASTM A240/A240M or ASTM A666, Type 304; sheet thickness as indicated; and as required to meet performance requirements.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.
2. Stainless Steel: Stainless steel sheet, Type 304, complying with ASTM A240/A240M or ASTM A666.
3. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

2.7 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: As specified in Division 08 Section "Door Hardware" and keyed to building keying system.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.

B. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Release mechanism for motor-operated doors allows testing without mechanical release of the door. Automatic-closing device is to be designed for activation by the following:

1. Building fire-detection, smoke-detection, and -alarm systems.

2.9 COUNTER DOOR ACCESSORIES

A. Fire-Rated, Laminate Counter: Fire-door manufacturer's high-pressure, decorative laminate-covered countertop; UL or ITS tested and labeled for 3/4-hour fire rating for approved use with fire-door assembly.

B. Fire-Rated, Stainless Steel Counter: Fire-door manufacturer's stainless steel countertop; UL or ITS tested and labeled for 3/4-hour fire rating for approved use with fire-door assembly.

2.10 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.11 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Concealed Tubular: Operator is mounted within hood.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For fire-rated doors, activation delays closing.

1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Type: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

2.12 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

A. Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.14 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: ASTM A480/A480M No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
B. Examine locations of electrical connections.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install coiling counter doors, switches, and controls along accessible routes in compliance with the accessibility standard.

D. Fire-Rated Doors: Install according to NFPA 80.

E. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

F. Power-Operated Doors: Install according to UL 325.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.

B. Perform the following tests and inspections:

1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.

2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, section 5.2.

C. Correct or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect corrected or replaced installations to determine if replaced or corrected door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
B. Lubricate bearings and sliding parts as recommended by manufacturer.
C. Adjust seals to provide tight fit around entire perimeter.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 08 33 13

SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-rated service doors.

B. Products Installed but not Furnished under This Section:

1. Steel support framing.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals (except field quality control reports) required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Fire-rated service doors.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, mounting details, and attachments to other work.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, detectors, and other accessories.
6. Include diagrams for power, signal, and control wiring.

D. Samples: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

E. Sample Warranty: For special warranty.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.
B. Warranty: Executed special warranty.
C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for installation of units required for this Project.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to correct or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Failure of components or operators before reaching required number of operation cycles.
c. Faulty operation of hardware.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.

2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Complying with NFPA 80; listed and labeled by qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design," ICC A117.1, and building Code in effect for Project.

2.3 FIRE-RATED SERVICE DOOR ASSEMBLY

A. Fire-Rated Service Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Clopay Building Products Co.; Model CERD10 Standard Heavy-Duty Fire-Rated Door.
b. CornellCookson, LLC; Roll Up Fire Resistant Door Model ERD10.
c. Wayne Dalton; Model 700 Rolling Steel Fire Door – FireStar.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000 operation cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Fire Rating: 3/4 hour.

D. Door Curtain Material: Stainless steel.

E. Door Curtain Slats: Flat profile slats of 2-7/16- to 2-5/8-inch center-to-center height.

1. Thickness: Not less than 0.0375 inch (20 gage) stainless steel; and as required to meet performance requirements.

F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from stainless steel and finished to match door.

G. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.

H. Hood: Stainless steel.

1. Thickness: Not less than 0.025 inch (24 gage) stainless steel.
2. Mounting: Face of wall.

I. Locking Devices: Equip door with locking device assembly and chain lock keeper.

1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from outside only, with cylinder inside and outside with cylinders.

J. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.

2. Operator Location: Wall.

3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. or lower.

4. Motor Exposure: Interior.

5. Motor Electrical Characteristics:

a. Horsepower: 3/4 hp.
b. Voltage: 115 V ac, single phase, 60 Hz.

6. Emergency Manual Operation: Chain type.

7. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar; self-monitoring type.

8. Control Station(s): Location as directed by Owner..

9. Other Equipment: Audible and visual signals.

K. Door Finish:

1. Stainless Steel Finish: ASTM A480/A480M No. 4 (polished directional satin).

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Stainless Steel Door Curtain Slats: ASTM A240/A240M or ASTM A666, Type 304; sheet thickness as indicated; and as required to meet performance requirements.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Stainless Steel: Stainless steel sheet, Type 304, complying with ASTM A240/A240M or ASTM A666.
2. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

2.7 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: As specified in Division 08 Section "Door Hardware" and keyed to building keying system.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.

B. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Release mechanism for motor-operated doors allows testing without mechanical release of the door. Automatic-closing device is to be designed for activation by the following:

1. Building fire-detection, smoke-detection, and -alarm systems.

2.9 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic-closing device operates.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For fire-rated doors, activation delays closing.

1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: ASTM A480/A480M No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
B. Examine locations of electrical connections.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.

D. Fire-Rated Doors: Install according to NFPA 80.

E. Power-Operated Doors: Install according to UL 325.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.

B. Perform the following tests and inspections:

1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.

2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

C. Correct or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect corrected or replaced installations to determine if replaced or corrected door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Entrance door systems.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and discuss the finishing of aluminum storefront that is required to be coordinated with the finishing of other aluminum work for color and finish matching.

2. Review, discuss, and coordinate the interrelationship of aluminum storefront with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.

3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.

4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section and by Division 08 Sections “Door Hardware” and “Glazing” concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. Entrance door hardware.
2. Accessories.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Thermally broken framing.
2. Nonthermal framing.
3. Thermal entrance doors.
4. Nonthermal entrance doors.
5. Flush entrance doors.

C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
3. Show provisions for coordination with door hardware, electrically operated door hardware, and access control and security systems.

D. Samples: For each type of exposed finish required, in manufacturer's standard sizes.

E. Sample Warranties: For special warranties.

1.6 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Performance Reports: For fiberglass reinforced polyester (FRP) face sheet doors, showing compliance with fire-performance and door construction requirements.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
B. Warranties: Executed special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to correct or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 2 years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to restore finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
c. Cracking, peeling, or chipping.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitation: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, and entrance doors when available, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.

2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

    a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 6 feet 9 inches or 1/175 times span, for spans of less than 6 feet 9 inches.

D. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..

F. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

    a. Thermal Entrance Doors: U-factor of not more than 0.77 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
    b. Flush Entrance Doors: U-factor of not more than 0.37 Btu/sq. ft. x h x deg F as determined according to NFRC 100.

2. Solar Heat-Gain Coefficient (SHGC):

    a. Thermally Broken Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.40as determined in accordance with NFRC 200.
    b. Thermal Entrance Doors: SHGC of not more than 0.40 as determined in accordance with NFRC 200.

3. Air Leakage:

    a. Thermally Broken Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283 or NFRC 400.

    b. Thermal and Flush Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

4. Condensation Resistance Factor (CRF):

    a. Thermally Broken Fixed Glazing and Framing Areas: CRF for the system of not less than 62 as determined in accordance with AAMA 1503.
    b. Thermal Entrance Doors: CRF of not less than 46 as determined in accordance with AAMA 1503.

G. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 STOREFRONT SYSTEMS, GENERAL

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Interior Framing Construction: Nonthermaland Thermally broken.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Glazing Plane: Center.
5. Finish: Color anodic finish.
6. Fabrication Method: Field-fabricated stick system.
7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
8. Steel Reinforcement: As required by manufacturer.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Insulated Spandrel Panels: Comply with Division 08 Section "Glazing."

2.4 STOREFRONT SYSTEM TYPES

A. Types: Provide the following types in locations indicated on Drawings:

1. Thermally broken framing.
2. Nonthermal framing.

2.5 THERMALLY BROKEN FRAMING

A. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1. EFCO Corporation; System 403X Dual-Thermal Flush-Glazed Storefront.
2. Kawneer; Trifab 451UT Framing System.
3. YKK AP America Inc.; YES 45 XT Storefront System.

B. Framing Size: 2-inch by 4-1/2-inch.

2.6 NONTHERMAL FRAMING

A. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1. EFCO Corporation; System 401 Flush-Glazed Storefront.
2. Kawneer; Trifab VersaGlaze 450 (1-3/4-inch Sightline) Framing System.
3. Special-Lite, Inc.; SL-45 FG Flush Glazed Tube Framing.
4. YKK AP America Inc.; YES 45 FS Storefront System.

B. Framing Size: 2-inch by 4-1/2-inch.

2.7 ENTRANCE DOOR SYSTEMS, GENERAL

A. Entrance Doors: Manufacturer's standard glazed and flush entrance doors for manual-swing or automatic operation.

B. Door Construction:

1. Thermal Entrance Door Construction: Glazed entrance doors with extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Nonthermal Entrance Door Construction: Glazed entrance doors with extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

3. Flush Entrance Door Construction: Fiberglass reinforced polyester (FRP) face sheet with poured-in-place or frothed-in-place urethane insulation and interlocked into extruded-aluminum rail and stile members to conceal edges of face sheets.

    a. Fiberglass Reinforced Polyester (FRP) Face Sheet: 0.120-inch-thick pebble-textured FRP.

        1) FRP door construction must comply with IBC 2603.4.1.7 or have special approval per IBC 2603.9.

        2) Surface-Burning Characteristics: For FRP face sheets facing the interior, surface-burning characteristics as follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.

            a) Flame-Spread Index: 25 or less.
            b) Smoke-Developed Index: 450 or less.

4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

5. Finish: Match adjacent storefront framing finish.

2.8 ENTRANCE DOOR TYPES

A. Types: Provide the following entrance door types in locations indicated on Drawings:

1. Thermal entrance doors.
2. Nonthermal entrance doors.
3. Flush entrance doors.

2.9 THERMAL ENTRANCE DOORS

A. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1. EFCO Corporation; Series D502 Wide Stile ThermaStile Entrances.
2. Kawneer; 500T Insulpour Thermal Entrances.
3. YKK AP America Inc.; MegaTherm 50XT Wide Stile Entrances.

B. Depth: 2- to 2-3/8-inch.

C. Door Design: Wide stile, 5-inch nominal width.

D. Bottom Rail: Height to comply with accessibility requirements.

2.10 NONTHERMAL ENTRANCE DOORS

A. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1. EFCO Corporation; Series D500 Wide Stile Entrance Door.
2. Kawneer; 500 Wide Stile Standard Entrance.
3. YKK AP America Inc.; Series 50D Wide Stile Swing Doors.

B. Depth: 1-3/4-inch.

C. Door Design: Wide stile, 5-inch nominal width.

D. Bottom Rail: Height to comply with accessibility requirements.

2.11 FLUSH ENTRANCE DOORS

A. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1. Aluminum Face Sheet Doors:

a. Kawneer; Flushline Entrances.
b. Special-Lite, Inc.; SL-16 Aluminum Flush Door.

2. Fiberglass Reinforced Polyester (FRP) Face Sheet Doors:

a. FRP Architectural Doors Inc.; FD25 Heavy Duty FRP Faced Door.
b. Special-Lite, Inc.; SL-17 Pebble Grain FRP/Aluminum Hybrid Door.

B. Depth: 1-3/4-inch.

C. Color: As selected by Architect from manufacturer's full range.

2.12 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Division 08 Section "Door Hardware."

B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.

1. Opening-Force Requirements:

a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.

b. Accessible Interior Doors: Not more than 5 lbf to fully open door.

C. Removable Mullions: BHMA A156.3 extruded aluminum.

1. When used with panic exit devices, provide keyed removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305. Use only mullions that have been tested with exit devices to be used.

D. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

E. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip or integrated into door bottom rail.

F. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.13 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."
B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
C. Glazing Sealants: As recommended by manufacturer.

2.14 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.15 ACCESSORIES

A. Automatic Door Operators: Comply with Division 08 Section.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.16 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops. Blade-type stops are not acceptable.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.17 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.

2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Division 07 Section "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF OPERABLE UNITS

A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.4 INSTALLATION OF GLAZING

A. Install glazing as specified in Division 08 Section "Glazing."

3.5 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.6 ERECTION TOLERANCES

A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.

3. Alignment:

   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.7 MAINTENANCE SERVICE

A. Entrance Door Hardware Maintenance:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

END OF SECTION 08 41 13

SECTION 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glazed aluminum curtain wall systems:

a. Conventionally glazed.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and discuss the finishing of glazed aluminum curtain walls that is required to be coordinated with the finishing of other aluminum work for color and finish matching.

2. Review, discuss, and coordinate the interrelationship of glazed aluminum curtain walls with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.

3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.

4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section and by Division 08 Section “Glazing” concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. Accessories.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Conventionally glazed aluminum curtain walls.

C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples: For each type of exposed finish required, in manufacturer's standard sizes.

E. Delegated-Design Submittal: For glazed aluminum curtain walls, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Sample Warranties: For special warranties.

1.6 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.

B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

C. Warranties: Executed special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

C. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of structural-sealant-glazed curtain wall assemblies.

1.9 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to correct or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 2 years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to restore finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, peeling, or chipping.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of curtain-wall system, including framing and accessories, and entrance doors from single manufacturer

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design glazed aluminum curtain walls.

B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure, including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans of greater than 13 feet 6 inches.

2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

E. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

G. Energy Performance: Certified and labelled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.34 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Solar Heat Gain Coefficient (SHGC):

a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.40 as determined in accordance with NFRC 200.

3. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283 or NFRC 400.

H. Condensation Resistance Factor (CRF):

1. Fixed Glazing and Framing Areas: CRF for the system of not less than 67 as determined in accordance with AAMA 1503.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS, GENERAL

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: Color anodic finish.
5. System: Stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

B. Pressure Caps: Manufacturer's standard low-conductance components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Insulated Spandrel Panels: Comply with Division 08 Section "Glazing."

E. Venting Windows: As specified in Division 08 Section "Aluminum Windows."

F. Entrance Door Systems: Comply with Division 08 Section "Aluminum-Framed Entrances and Storefronts".

2.4 GLAZED ALUMINUM CURTAIN WALL SYTEM TYPES

A. Type: Provide the following glazed aluminum curtain wall system type in locations indicated on Drawings:

1. Conventionally glazed aluminum curtain wall systems.

2.5 CONVENTIONALLY GLAZED ALUMINUM CURTAIN WALL SYSTEMS

A. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1. EFCO Corporation: System 5600 Thermal Curtain Wall with Fiberglass Pressure Plate.
2. Kawneer Company, Inc.; 1600UT (Ultra Thermal) System 1 Curtain Wall System (with fiberglass pressure plates).
3. YKK AP America Inc.; YCW 750 OGP Aluminum Curtain Wall System.

B. Framing Size: 2-1/2-inch by 6-inch.

2.6 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."

B. Glazing Gaskets: ASTM C509 or ASTM C864. Manufacturer's standard.

1. Color: Black.

C. Glazing Sealants: As recommended by manufacturer.

D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes into contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.

1. Color: Match structural sealant.

2.7 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.8 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Fabricate components to resist water penetration as follows:

1. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.

F. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.10 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

G. Seal joints watertight unless otherwise indicated.

H. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF OPERABLE UNITS

A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.4 INSTALLATION OF GLAZING

A. Install glazing as specified in Division 08 Section "Glazing."

3.5 INSTALLATION OF WEATHERSEAL SEALANT

A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass, as recommended by sealant manufacturer.
B. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.6 ERECTION TOLERANCES

A. Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.

3. Alignment:

   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Special Inspections are required for the work of this Section. Refer to Division 01 Section “Quality Requirements” and its attachments.
B. Testing Agency: Engage a qualified testing agency to perform following tests and inspections.
C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
D. Prepare test and inspection reports.

END OF SECTION 08 44 13

SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes aluminum windows for exterior locations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.

2. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.

3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.

4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section and by Division 08 Section “Glazing” concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, and finishes.

1. Hardware.
2. Accessories.
3. Insect screens.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Double hung windows.

C. Shop Drawings: For aluminum windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
2. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples: For each type of exposed finish required, in manufacturer's standard sizes.

E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

F. Sample Warranties: For special warranties.

1.6 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum windows, from manufacturer.

1. Basis for Certification: Energy performance values for each aluminum window meeting specified NFRC requirements.

B. Product Certificates: For rescue windows, certifying clear opening complies with specified minimum clear opening requirements.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum windows to include in maintenance manuals.
B. Warranties: Executed special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to correct or replace aluminum windows that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to restore finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E 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, peeling, or chipping.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum windows, including accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as indicated.

C. Water Infiltration: No uncontrolled water leakage when tested in accordance with ASTM E331 and ASTM E547 at a static air pressure difference of 12 lbf/sq. ft.

D. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance: NFRC 100 maximum whole-window U-factor as follows:

a. For operable windows: 0.43 Btu/sq. ft. x h x deg F.

2. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

3. Air Infiltration: Maximum air leakage rate of 0.3 cfm/sq. ft. when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 at 6.24 psf.

E. Condensation-Resistance Performance: Provide aluminum windows tested for thermal performance according to either of the following:

1. AAMA 1503, showing a minimum Condensation-Resistance Factor (CRF) of 61, or
2. NFRC 500, showing a minimum Condensation Resistance (CR) of 51**.**

F. Thermal Movements: Provide aluminum windows, including anchorage, 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 joint sealants, 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: 120 deg F ambient; 180 deg F material surfaces.

G. Accessibility Requirements: For window hardware, comply with the USDOJ's "2010 ADA Standards for Accessible Design," ICC A117.1, and building Code in effect for Project.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

2.3 ALUMINUM WINDOWS, GENERAL

A. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/ I.S.2/A440.

1. Thermally Broken Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

B. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

C. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ALUMINUM WINDOW TYPES

A. Types: Provide the following aluminum window types in locations indicated on Drawings:

1. Double hung.

2.5 DOUBLE HUNG WINDOWS

A. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1. EFCO Corporation: Series HX45 Double Hung
2. Graham Architectural Products; GT2200 Series Double Hung.
3. Kawneer Company, Inc.; Series AA 5450 Ultra Thermal Double Hung.

B. Overall Unit Depth: 4 to 4-5/8 inches.

C. Minimum Performance Class and Grade: AW-PG65-H.

2.6 WINDOW HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
2. Provide latches with single-handed operation at rescue window locations.

B. Hung Window Hardware:

1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
3. Tilt Latch: Releasing latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

2.7 GLAZING

A. Glass: Comply with Division 08 Section "Glazing."
B. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.8 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location:

a. Full, outside for double-hung.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch-diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

2.9 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.10 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 08 51 13

SECTION 08 56 53 – SLIDING SECURITY WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sliding, bullet-resistance-rated transaction security window assemblies.
2. Sliding, transaction security window assemblies.

1.3 COORDINATION

A. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, anchor bolts, and items with integral anchors, that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.

1. Sliding, bullet-resistance-rated transaction security window assemblies.
2. Sliding, transaction security window assemblies.

B. Shop Drawings: For security windows.

1. Include plans, elevations, sections, and attachment details.
2. Hardware for sliding window units.
3. Glazing details.

C. Samples: For frame members with factory-applied color finishes.

1.6 INFORMATIONAL SUBMITTALS

A. Bullet-Resistance-Rated Performance Certification: For each type of bullet-resistance-rated security window assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Pack security windows in wood crates for shipment.
B. Label security window packaging with drawing designation.
C. Store crated security windows on raised blocks to prevent moisture damage.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Bullet-Resistance-Rated Transaction Security Window Assembly: Provide units identical to those tested for compliance with requirements indicated, and as follows:

1. Listed and labeled as Level 3 when tested according to UL 752.

2.2 SLIDING, TRANSACTION SECURITY WINDOWS

A. Provide sliding, transaction security windows.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Quikserv Corp.
b. Safewood Designs

B. Configuration: One fixed-glazed panel and one horizontal-sliding glazed panel.

C. Operation: Manual open/self-closing.

D. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum.

E. Sliding Window Hardware: Provide roller track designed for overhead support of manufacturer's standard carrier supporting horizontal-sliding glazed panel with manufacturer's standard self-closing mechanism mounted in header. Provide self-latching and self-locking pull and lock with two keys for each horizontal-sliding glazed panel. Provide with security bar.

F. Glazing and Glazing Materials: Comply with requirements in Division 08 Section " Glazing" and as follows:

1. Bullet-Resistance-Rated Laminated-Glass Security Glazing (Glass Type BCL)as specified in Division 08 Section “Glazing.”

G. Materials:

1. Mild Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.

3. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.

4. Aluminum Extrusions: ASTM B221. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength.

5. Aluminum Sheet and Plate: ASTM B209.

2.3 FABRICATION

A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.

1. Provide units that are reglazable from the secure side without dismantling the attack side of framing.

B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.

1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with bullet-resistance performance indicated.

C. Glazing Stops: Finish glazing stops to match security window framing.

1. Attack-Side (Exterior) Glazing Stops: Welded or integral to framing.
2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.

D. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

E. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated. Installation orientation of glazing to meet performance requirements. Comply with requirements in Division 08 Section " Glazing."

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.6 ACCESSORIES

A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

B. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16 inch thick; with minimum 1/2-inch-diameter, headed studs welded to back of plate.

C. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security windows.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.

C. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements.

1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional work.

D. For factory-installed glazing materials whose orientation (secure or attack side) is critical for performance, verify installation orientation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

F. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.

B. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless-steel fasteners.

C. Sealants: Comply with requirements in Division 07 Section "Joint Sealants" for installing sealants, fillers, and gaskets.

D. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.3 ADJUSTING

A. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.
B. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.4 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess sealant, dirt, and other substances.

1. Lubricate sliding security window hardware.

B. Clean glass of preglazed security windows promptly after installation. Comply with requirements in Division 08 Section " Glazing" for cleaning and maintenance.

C. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain operable security windows.

END OF SECTION 08 56 53

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:

    a. Swinging doors.

2. Cylinders for door hardware specified in other Sections.
3. Electrified door hardware.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

1. Hinges.
2. Continuous hinges.
3. Mortise locks.
4. Electric strikes.
5. Exit devices and auxiliary items.
6. Lock cylinders.
7. Construction cores.
8. Keying system/keys.
9. Key control software.
10. Cross-index system.
11. Surface closers.
12. Wall stops.
13. Electromagnetic door holders.
14. Door gasketing.
15. Metal protective trim units.
16. Auxiliary hardware.

B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: For power, signal, and control wiring and including the following:

a. Details of interface of electrified door hardware and building safety and security systems.

2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

C. Samples for Verification: For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule.

1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.

D. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
2. Content: Include the following information:

a. Identification number, location, hand, fire rating, size, and material of each door and frame.
b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
e. Fastenings and other pertinent information.
f. Explanation of abbreviations, symbols, and codes contained in schedule.
g. Mounting locations for door hardware.

E. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

F. Warranty: Sample of special warranty specified in this Section.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For electrified door hardware, from the manufacturer.

1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

B. Warranty: Executed special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
2. 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.

B. Architectural Hardware Consultant Qualifications: A 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 who is currently certified by DHI as follows:

1. For door hardware, an Architectural Hardware Consultant (AHC) who is also an Electrified Hardware Consultant (EHC).

C. Source Limitations: Obtain each type of door hardware from a single manufacturer.

D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet 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. at the tested pressure differential of 0.3-inch wg of water.

F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

G. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1 and building code in effect for Project.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:

   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
   b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

I. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss preparatory work performed by other trades.
2. Inspect and discuss electrical roughing-in for electrified door hardware.
3. Review sequence of operation for each type of electrified door hardware.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1.9 COORDINATION

A. 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.

B. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

C. 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.

1.10 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. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of doors and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

a. Exit Devices: Two years from date of Substantial Completion.
b. Manual Closers: Lifetime.
c. Locksets: Lifetime
d. Hinges: Lifetime

1.11 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products or products equivalent in function and comparable in quality to named products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Electric Locking Hardware: Exit hardware shall always remain fully operational manually regardless of the status of electric latch.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Best
b. Hager
c. Stanley

2.3 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch-thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ABH
b. Best
c. Select

2.4 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Locks: Minimum 3/4-inch latchbolt throw.

C. Lock Backset: 2-3/4 inches, unless otherwise indicated.

D. Lock Trim:

1. Levers:

a. 14H

E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

F. Mortise Locks: BHMA A156.13; Operational and Security Grade 1; stamped steel case with steel or brass parts; Series 1000.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Best

2.5 ELECTRIC STRIKES

A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dormakaba
b. Securitech
c. Von Duprin

2.6 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Precision
b. Von Duprin

2.7 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work:

    a. Best

B. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.8 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.

1. Master Key System: Change keys and a master key operate cylinders.
2. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
3. Existing System:

    a. Master key or grand master key locks to Owner's existing system.

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

    a. Notation: "DO NOT DUPLICATE."

2. Quantity: In addition to one extra key blank for each lock, provide the following:

    a. Cylinder Change Keys: Three.
    b. Master Keys: Five.
    c. Grand Master Keys: Five.

2.9 KEY CONTROL SYSTEM

A. Key Control Software: Provide as specified.

2.10 OPERATING TRIM

A. Operating Trim: As specified.

2.11 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; Cast iron with 1-1/2” minimum bore piston, rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Best.
b. LCN.
c. Sargent.

2.12 MECHANICAL STOPS AND HOLDERS

A. Wall Stops: BHMA A156.16; brushed chrome plated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ABH
b. Rockwood
c. Trimco

2.13 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. National Guard Products.
b. Pemko.
c. Reese.
d. Zero.

2.14 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch-thick stainless steel with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ABH
b. Rockwood
c. Trimco.

2.15 AUXILIARY DOOR HARDWARE

A. Auxiliary Hardware: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ABH
b. Best
c. Trimco

2.16 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:

a. Wood or Machine Screws: For the following:

1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors.
2) Strike plates to frames.
3) Closers to doors and frames.

b. Steel Through Bolts: For the following unless door blocking is provided:

1) Surface hinges to doors.
2) Closers to doors and frames.
3) Surface-mounted exit devices.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.17 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine 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. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

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: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

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. Custom Steel Doors and Frames: HMMA 831.
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying schedule.

E. Key Control: Tag keys as determined by final keying schedule.

F. Stops: Provide wall stops for doors unless other type stops are indicated in door hardware schedule.

G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 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. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately six 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.

3.5 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 that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

Set #1 Not Used

Set #2

Doors: 123.2/1

3	Butt Hinge	CB1900R 4.5" x 4.5" BAA	652	BE
1	Privacy Set	45H-0L14H VIN	630AM	BE
1	Overhead Stop	N 4020 T	630	AB
1	Kick Plate	ABPP .050 8" ADH	630	AB
1	Gasketing	2525 C		NA

Set #3 Not Used

Set #4

Doors: 100.7/1, 100.9/1

3	Butt Hinge	CB1900R 4.5" x 4.5" BAA	652	BE
1	Lockset	45H-7AB14H PATD	630AM	BE
1	Door Closer	QDC111	689	BE
1	Kick Plate	ABPP .050 8" ADH	630	AB
1	Wall Bumper	AB403	626	AB
1	Gasketing	2525 C		NA

Set #5 - No Hardware Required

Doors: 100.8/2, 100.9/3

Set #6 Not Used

Set #7 Not Used

Set #8 Not Used

Set #9 Not Used

Set #10

Doors: 100.6/1

3	Butt Hinge	CB1900R 4.5" x 4.5" BAA	652	BE
1	Lockset	45H-7R14H PATD	630AM	BE
1	Door Closer	QDC111 DA	689	BE
1	Kick Plate	ABPP .050 8" ADH	630	AB
1	Wall Bumper	AB403	626	AB
1	Gasketing	2525 C		NA

Set #11 – Exterior, Card Reader, Auto Operator, Remote Locking/Unlocking

Doors: 95/2

1	Continuous Hinge	A240HD	628	AB
1	Power Transfer	PT1000	689	AB
1	Exit Device	ELR TS 2403 CD	630AM	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Door Pull	ABAP311 24"	630AM	AB
1	Card Reader	BY SECURITY		
1	Low Energy Operator	D-4990	689	BE
1	Power Supply	ELR151	600	PR
1	Threshold	896 S	628	NA
1	Door Sweep	C627 A	628	NA
1	Overhead Stop	N 1020 A	630	AB

NOTE: Provide hands free actuators and relays as required. Provide desk mounted push button switch at reception.

Set #12 – Exterior, Remote Locking/Unlocking

Doors: 95/1

2	Continuous Hinge	A240HD	628	AB
2	Power Transfer	PT1000	630	AB
2	Exit Device	ELR 2602 CD	630AM	PR
2	Mortise Cylinder	1E-74 PATD	626	BE
2	Door Pull	ABAP311 24"	630AM	AB
2	Door Closer	QDC111 TOP JAMB	689	BE
2	Overhead Stop	N 1020 A	630	AB
2	Power Transfer	PT1000	689	AB
2	Door Sweep	C627 A	628	NA
1	Threshold	896 S	628	NA
1	Power Supply	ELR152	600	PR

NOTE: Provide remote lock/unlock switch at reception desk.

Set #13 - Security Vestibule

Doors: 95/3

2	Continuous Hinge	A240HD	628	AB
2	Exit Device	2602 CD	630AM	PR
2	Door Pull	ABAP311 24"	630AM	AB
2	Door Closer	QDC111 TOP JAMB	689	SH
2	Overhead Stop	N 1020 A	630	AB
2	Lockdown Hardware	LDH100-PHI	626	TR

Set #14 – Security Vestibule, Auto Operator, Remote Locking/Unlocking

Doors: 95/4

1	Continuous Hinge	A240HD	628	AB
1	Exit Device	ELR TS 2403 CD	630AM	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Pull	ABAP311 24"	630AM	AB
1	Card Reader	BY SECURITY		
1	Door Closer	QDC111 TOP JAMB	689	BE
1	Low Energy Operator	D-4990	689	BE
1	Overhead Stop	N 1020 A	630	AB
1	Power Transfer	PT1000	689	AB
1	Power Supply	ELR151	600	PR

NOTE: Provide hands free actuators and relays as required.

Set #15 - Card Reader, Remote Entry

Doors: 100.8/1

3	Butt Hinge	CB1900R 4.5" x 4.5" BAA	652	AB
1	Lockset	45H-7AB14H PATD	630AM	BE
1	Electric Strike	AS REQUIRED	630	DO

1	Card Reader	BY SECURITY		
1	Door Closer	QDC111	689	BE
1	Kick Plate	ABPP .050 8" ADH	630	AB
1	Wall Bumper	AB403	626	AB
1	Card Reader	BY SECURITY		BY
1	Gasketing	2525 C		NA

Set #16

Doors: 100.9/2

3	Butt Hinge	CB1900R 4.5" x 4.5" BAA	652	BE
1	Lockset	45H-7AB14H PATD	630AM	BE
1	Door Closer	QDC112	689	BE
1	Kick Plate	ABPP .050 8" ADH	630	AB
1	Wall Bumper	AB403	626	AB
1	Coat Hook	AM801	630	AB
1	Gasketing	2525 C		NA
1	Auto Door Bottom	220 S		NA

Set #17 **Hold Open**

Doors: F/1, 125/1

2	Continuous Hinge	A240HD	628	AB
2	Exit Device	FL 2808 X 4908D LBR	630AM	PR
2	Rim Cylinder	12E-72 PATD	626	BE
2	Electromagnetic Door Holder	2100 RS	630	AB
2	Door Closer	QDC111	689	BE
2	Kick Plate	ABPP .050 8" ADH	630	AB
1	Gasketing	2525 C		NA

Set #18 - Exterior, Kitchen Dock Entry, Hold Open

Doors: 124/1

2	Continuous Hinge	A240HD	628	AB
2	Exit Device	FL2808 X 4908D CD LBR	630AM	PR
2	Rim Cylinder	12E-72 PATD	626	BE
2	Mortise Cylinder	1E-74 PATD	626	BE
2	Door Closer	QDC117 DA	689	BE
2	Wall Magnets	2100 RS	630	AB
2	Armor Plate	ABPP .050 34" ADH	630	AB
2	Frame Guard	ABFG8000 36”	630	AB
2	Lockdown Hardware	LDH100-PHI	626	TR
2	Door Sweep	C627 A	628	NA
2	Weatherstrip	700 ES	628	NA
1	Threshold	896 S	628	NA
2	Compensating Astragal	110 S	628	NA

Set #19

Doors: 125.1/1, 125/3

1	Padlock	41B-772T PATD M1	RED	BE

Set #20 – Hold Open

Doors: 125/2

1	Continuous Hinge	A240HD	628	AB
1	Push/Pull Classroom Set	J 6656 AM	630AM	AB
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Door Closer	QDC111	689	BE
1	Wall Magnet	2100 RS	630	AB
1	Kick Plate	ABPP .050 8" ADH	630	AB
1	Mop Plate	ABPP .050 4" ADH	630	AB
1	Gasketing	2525 C		NA

Set #21 - FRP

Doors: 122/1

2	Continuous Hinge	A240HD	628	AB
2	Dummy Touchbar	N673DR	630	PR
2	Flush Pull	AB1111C	630	AB
2	Door Closer	QDC114	689	BE
2	Gasketing	2525 C		NA
2	Auto Door Bottom	320 S	628	NA

Set #22 - Exterior, Card Reader, FRP

Doors: 87/1, 122/2

2	Continuous Hinge	A240HD	628	AB
2	Exit Device	ELR 2803 CD	630AM	PR
2	Rim Cylinder	12E-72 PATD	626	BE
2	Mortise Cylinder	1E-74 PATD	626	BE
2	Flush Pull	AB1111C	630AM	AB
2	Door Closer	QDC111 TOP JAMB	689	BE
2	Overhead Stop	N 1020 A	630	AB
2	Kick Plate	ABPP .050 8"	630	AB
2	Power Transfer	PT1000	689	AB
2	Lockdown Hardware	LDH100-PHI	626	TR
1	Power Supply	ELR152	600	PR
1	Card Reader	BY SECURITY		BY
2	Door Sweep	C627 A	628	NA
1	Threshold	896 S	628	NA

Set #23

Doors: 125.2/1

3	Butt Hinge	CB1900R 4.5" x 4.5" BAA	652	BE
1	Lockset	45H-7AB14H PATD	630AM	BE
1	Door Closer	QDC114	689	BE
1	Kick Plate	ABPP .050 8" ADH	630	AB
1	Coat Hook	AM801	630	AB
1	Gasketing	2525 C		NA
1	Auto Door Bottom	220 S		NA

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glass products.
2. Laminated glass.
3. Fire-protection-rated glazing.
4. Security glazing.
5. Insulating glass.
6. Security glazing attachment system.

1.3 DEFINITIONS

A. Fire-Protection-Rated Glazing: Glazing in rated doors and openings up to 45 minutes (with certain exceptions), limited in size, and not capable of blocking radiant heat.

B. Fire-Resistance-Rated Glazing: Glazing that prevents spread of fire and smoke and radiant heat; used in rated wall and door applications 60 minutes and above without size limitations (generally to maximum size tested).

C. Glazing Manufacturers: Firms that produce primary glazing, fabricated glazing, or both, as defined in referenced glazing publications.

D. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

E. IBC: International Building Code.

F. Interspace: Space between lites of an insulating-glass unit.

G. SHGC: Solar Heat Gain Coefficient.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1. Coordinate framing types to provide proper framing fire rating.
2. Coordinate framing types to provide proper framing forced-entry-resistance rating.
3. Coordinate framing types to provide proper framing bullet-resistance rating.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation 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.
2. Review, discuss, and coordinate the interrelationship of glazing with other components, including framing.
3. Review temporary protection requirements for glazing during and after installation.

1.6 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section and by Division 08 Section**s** “Hollow Metal Doors and Frames”, “Flush Wood Doors”, “Aluminum-Framed Entrances and Storefronts”, “Aluminum Windows”, and “Sliding Security Windows,” concurrently.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Insulating glass.
2. Insulated spandrel panels.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the “As-Specified Verification Form” (attached to Division 01 Section “Submittal Procedures”) for each item listed below; otherwise submit full Product Data for the following:

1. Glass products.
2. Fire-protection-rated glazing.
3. Security glazing.
4. Security glazing attachment system.

C. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

D. Samples: For each type of the following products; 12 inches square.

1. Fire-protection-rated glazing.
2. Security glazing.
3. Insulating glass.
4. Insulated spandrel panels.

E. Glazing Schedule: List glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

F. Delegated Design Submittal: For glazing indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

G. Sample Warranties: For special warranties.

1.8 INFORMATIONAL SUBMITTALS

A. Forced-Entry-Resistance-Rated Certification: For each type of forced-entry-resistance-rated security glazing for tests performed by a qualified testing agency indicating compliance with performance requirements.

B. Bullet-Resistance-Rated Performance Certification: For each type of bullet-resistance-rated security glazing for tests performed by a qualified testing agency indicating compliance with performance requirements.

C. Preconstruction adhesion and compatibility test report.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazing to include in maintenance manuals.
B. Warranties: Executed special warranties.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Maintain protective coverings on glazing to avoid exposures to abrasive substances, excessive heat, and other sources of possible deterioration.

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.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.12 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer or manufacturer/fabricator, as applicable, agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer or manufacturer/fabricator, as applicable, agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard. “Laminated Glass”, as used in this paragraph, includes clear laminated glass, and fire-protection-rated laminated ceramic glass,.

1. Warranty Period: 5 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Tempered Glazing Units with Clear Intumescent Interlayer: Manufacturer or manufacturer/fabricator, as applicable, agrees to replace units that deteriorate within specified warranty period. Deterioration of tempered glazing units with clear intumescent interlayer is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass contrary to manufacturer's written instructions. Evidence of failure is air bubbles within units, or obstruction of vision by contamination or deterioration of intumescent interlayer.

1. Warranty Period: 5 years from date of Substantial Completion.

D. Manufacturer's Special Warranty for Laminated-Glass Security Glazing: Manufacturer or manufacturer/fabricator, as applicable, agrees to replace laminated-glass security glazing units that deteriorate within specified warranty period. Deterioration of laminated glass security glazing is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass security glazing contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard. "Laminated-Glass Security Glazing", as used in this paragraph, includes clear laminated-glass security glazing and bullet-resistance-rated laminated-glass security glazing.

1. Warranty Period: 5 years from date of Substantial Completion.

E. Manufacturer's Special Warranty for Insulating Glass: Manufacturer or manufacturer/fabricator, as applicable, agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Where laminated glass is used as a component in an insulating-glass unit, deterioration of the laminated glass itself is covered by the paragraph "Manufacturer's Special Warranty for Laminated-Glass Security Glazing" above, and deterioration of the insulating glass due to failure of hermetic seal is covered by this paragraph "Manufacturer's Special Warranty for Insulating Glass."

2. Warranty Period: 10 years from date of Substantial Completion.

F. Manufacturer's Special Warranty for Aluminum-Faced Insulated Spandrel Panels: Manufacturer agrees to replace insulated spandrel panels that deteriorate within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Delamination of components or other failures of bond.
b. Warping of components.

2. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glazing: For each glazing type, obtain from single manufacturer.
B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

1. Installed security glazing shall withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:

1. Wind Loads: As indicated on Drawings.

2. Maximum Lateral Deflection: For glazing supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less. Maintain engagement of the glazing edge with an appropriate margin of safety under all conditions.

3. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Security Glazing: Installed security glazing shall withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.

E. Bullet-Resistance-Rated Glazing: Where bullet-resistance-rated glazing is indicated, provide glazing complying with bullet-resistance level indicated, based on testing according to UL 752.

F. Thermal and Optical Performance Properties: Provide glazing with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.

2. For laminated-glass lites, properties are based on products of construction indicated.

3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

4. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.

5. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.

2.3 GLAZING PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glazing product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGIA Publication for Insulating Glass: IGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glazing, thickness, and safety glazing standard with which glazing complies.

C. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether glazing has passed hose-stream test; whether glazing meets 450 deg F temperature-rise limitation; and fire-resistance rating in minutes.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.

E. Thickness: Where glazing thickness is indicated, it is a minimum. Provide glazing that complies with performance requirements and is not less than thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.

F. Strength: Where heat-strengthened float glass is indicated, provide heat-strengthened float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

B. Low-Iron Annealed Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent.

C. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion horizontally parallel to bottom edge of glass as installed unless otherwise indicated.

2. Clear Glass:

a. Type FC: Fully tempered clear float glass.

1) Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

a) AGC Glass Company North America, Inc.; Clear Float.
b) Guardian Glass, LLC; Clear Float.
c) Vitro Architectural Glass; Clear.

2) Minimum Thickness: 6 mm.

3) Safety glazing required.

b. Type FCE: Fully tempered clear float glass with low-e coating, ASTM C1376.

1) Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

a) AGC Glass Company North America, Inc.; Energy Select 28.
b) Guardian Glass, LLC; SunGuard SNX 62/27 on Clear Float.
c) Vitro Architectural Glass; Solarban 70.

2) Minimum Thickness: 6 mm.

3) Safety glazing required.

D. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion horizontally parallel to bottom edge of glass as installed unless otherwise indicated.

E. Tempered Patterned Glass: ASTM C1048, Kind FT (fully tempered), Type II, Class 1 (clear), Form 3; finish, pattern, and quality as indicated.

1. Type FCP: Fully tempered clear patterned glass.

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

1) Guardian Glass, LLC; Textures.

2) Pilkington North America; Texture Glass.

b. Minimum Thickness: 6 mm.

c. Pattern: As selected by Architect from manufacturer's full range.

d. Safety glazing required.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.

2. Interlayer Thickness: Provide thickness not less than 0.060 inch and as needed to comply with requirements.

3. Interlayer Color: Clear.

4. Appearance: Provide laminated glass without haze and with visual clarity and transparency indistinguishable from clear fully tempered float glass.

5. Type HCL: Clear laminated glass (two plies of clear heat-strengthened float glass laminated).

a. Minimum Thickness of Each Ply: 4 mm.
b. Safety glazing required.

2.6 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including hose-stream test, and shall comply with NFPA 80.

B. Appearance: Provide fire-protection-rated glazing without haze and with visual clarity and transparency indistinguishable from clear fully tempered float glass.

C. Fire-Protection-Rated Tempered Glass: Fire-protection-rated tempered glass; complying with 16 CFR 1201, Category II.

1. Type FP: Fire-protection-rated tempered glass, exempted from the hose-stream test.

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1) Safti First Fire Rated Glazing Solutions; SuperLite I.
2) Technical Glass Products; Fireglass 20.
3) Vetrotech Saint-Gobain; Pyroswiss 20.

b. Rating: 20 minutes.

c. Thickness: 6 mm.

d. Safety glazing required.

D. Fire-Protection-Rated Laminated Ceramic Glazing: Laminated glass made from two plies of clear, ceramic glass; complying with 16 CFR 1201, Category II.

1. Type FPC: Fire-protection-rated laminated ceramic glazing.

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1) Safti First Fire Rated Glazing Solutions; Pyran Platinum L.
2) Technical Glass Products; FireLite Plus.

b. Rating: 45 minutes 60 minutes 90 minutes.

c. Thickness: 8-9 mm.

d. Safety glazing required.

2.7 SECURITY GLAZING

A. Laminated-Glass Security Glazing: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Laminated glass made from multiple plies of uncoated, ultraclear (low-iron) float glass and complying with 16 CFR 1201, Category II.

1. Type SCL: Clear laminated-glass security glazing.

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1) Global Security Glazing; Childgard 2118.
2) LTI Smart Glass, Inc.; SG5 by School Guard Glass.
3) Oldcastle BuildingEnvelope, a CRH Company; ArmorGarde Plus.

b. Forced-Entry Resistance:

1) Class 1.4 according to ASTM F1233.

2) H. P. White 5-aa1 assault test-rated for not less than 12 minutes, as a continuous attack.

a) Withstand a minimum of 5 shots from a military-style assault rifle with a minimum caliber of 7.62 mm.

b) Withstand a minimum of abuse as applied by a single assailant at full force, including strikes with bricks, hammers, baseball bats, and sledgehammers.

c. Nominal Overall Thickness: 7/16- to 9/16-inch.

d. Interlayer Thickness: As required for performance indicated.

e. Interlayer Color: Clear.

f. Appearance: Provide clear laminated-glass security glazing without haze and with visual clarity and transparency indistinguishable from clear fully tempered float glass.

g. Safety glazing required.

B. Bullet-Resistance-Rated Laminated-Glass Security Glazing: Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Laminated glass made from multiple plies of uncoated, ultraclear (low-iron) float glass; and complying with 16 CFR 1201, Category II.

1. Type BCL: Bullet-resistance-rated clear laminated-glass security glazing.

a. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

1) California Glass Bending Corp.; Bullet-Resistant Level III-All Glass.
2) Global Security Glazing; Bullet Resistant (All Glass) BR-233.
3) Oldcastle BuildingEnvelope, a CRH Company; ArmorResist 213000.

b. Bullet-Resistance: Level 3 according to UL 752.

c. Thickness: As required for performance indicated.

d. Interlayer Color: Clear.

e. Appearance: Provide bullet-resistance-rated clear laminated-glass security glazing without haze and with visual clarity and transparency indistinguishable from clear fully tempered float glass.

f. Safety glazing required.

2.8 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Perimeter Spacer: Manufacturer’s standard Warm Edge Technology (WET) spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.
4. Interspace Content: Argon (90 percent)/air (10 percent) mix.

B. Insulating Security Glass:

1. Type FCE/SCL: Low-e-coated, laminated-glass security insulating glass.

a. Overall Unit Thickness: 1-3/16 inch.

b. Outdoor Lite: Fully tempered clear float glass with low-e coating, Type FCE.

c. Low-E Coating: Sputtered on second surface.

d. Interspace Content: Argon.

e. Indoor Lite: Clear laminated-glass security glazing, Type SCL.

f. Glass Unit Performance Values:

1) Winter Nighttime U-Factor: 0.24 Btu/sq. ft. x h x deg F maximum.
2) SHGC: 0.28 maximum.
3) Visible Light Transmittance: 57 percent minimum.

C. Insulating Vision Glass:

1. Type FCE/FCP: Low-e-coated, patterned insulating glass.

a. Overall Unit Thickness: 1 inch.

b. Outdoor Lite: Fully tempered clear float glass with low-e coating, Type FCE.

c. Low-E Coating: Sputtered on second surface.

d. Interspace Content: Argon.

e. Indoor Lite: Fully tempered clear patterned glass, Type FCP.

f. Pattern: Located on fourth surface.

g. Glass Unit Performance Values:

1) Winter Nighttime U-Factor: 0.24 Btu/sq. ft. x h x deg F maximum.
2) SHGC: 0.28 maximum.
3) Visible Light Transmittance: 62 percent minimum.”.

2.9 INSULATED SPANDREL PANELS

A. Insulated Spandrel Panels: Laminated, rabbeted, aluminum-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mapes Industries, Inc.; Mapes-R+ 8-ply, or comparable product, including, but not limited to, products by:

    a. Nudo Products.

2. Overall Panel Thickness: 2-inch (including 1-inch glazing leg).

3. Exterior Skin: Aluminum.

    a. Thickness: 0.032-inch.
    b. Finish: Color anodic finish.
    c. Texture: Smooth.
    d. Backing Sheet: 0.157-inch-thick, cement board.

4. Exterior Skin: Heat-strengthened clear float glass, ceramic-coated spandrel glass.

    a. Thickness: 0.25-inch.
    b. Opaque Coating Location: Second surface.
    c. Coating Color: As selected by Architect from manufacturer’s full range.

5. Glazing Leg Core: Same as thermal insulation core, with smooth aluminum skin.

6. Thermal Insulation Core: Manufacturer's standard rigid, closed-cell, polyisocyanurate board.

7. Interior Skin: Aluminum.

    a. Thickness: 0.032-inch.
    b. Finish: Color anodic finish.
    c. Texture: Smooth.
    d. Backing Sheet: 1/2-inch-thick, gypsum board with proprietary fire-resistance-rated core.

8. Overall U-factor: 0.24 Btu/sq. ft. x h x deg F maximum.

9. Surface Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

2.10 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glazing products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Sealant shall have a VOC content of 250 g/L or less.

4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

2.11 SECURITY GLAZING ATTACHMENT SYSTEM

A. Attachment System: Structural sealant wet glaze adhesive, moisture curable, weatherable, UV-resistant, attachment system.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Dow Chemical Company (The); DOWSIL995 Silicone Structural Sealant, or comparable product approved by security glass manufacturer in writing.

   a. Color: As selected by Architect.

2. Material Properties, as Supplied:

   a. Typical Cure Time: 7 to 14 days at 25 degrees C, 50 percent RH.
   b. Full Adhesion: 14 to 21 days.
   c. Tack-Free Time, per ASTM D5895: 65 minutes at 25 degrees C, 50 percent RH.
   d. Flow, Sag or Slump, per ASTM D2202: 0.1 inches.
   e. Working Time: 10 to 20 minutes at 25 degrees C, 50 percent RH.
   f. Specific Gravity: 1.4.
   g. VOC Content: 30 g/l.

3. Material Properties, as Cured – 21 days at 25 degrees C, 50 percent RH:

    a. Ultimate Tensile Strength, per ASTM D412: 170 psi.
    b. Ultimate Elongation, per ASTM D412: 525%.
    c. Durometer Hardness, Shore A, per ASTM D2240: 40 points.
    d. Tear Strength, Die B, per ASTM D624: 49 ppi.

4. Uniform consistency and appearance, with no clumping.

5. Impact Resistance and Pressure Cycling:

    a. As part of a security glass system, glazing attachment demonstrates ability to withstand Medium Large Missile C and Small Missile A impact, with subsequent pressure cycling, per ASTM E1996 and ASTM E1886 at +/- 75 psf design pressure.

    b. As part of a security glass system, glazing attachment demonstrates ability to withstand structural load requirements of ASTM E330 when tested at +/- 100 psf design pressure.

2.12 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glazing manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

    1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
    2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

    1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
    2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.13 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, including security applications, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:

1. Elastomeric material with Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended in writing by sealant or glazing manufacturer.

D. Spacers:

1. Elastomeric blocks or continuous extrusions of hardness required by glazing manufacturer to maintain glazing lites in place for installation indicated.
2. Type recommended in writing by sealant or glazing manufacturer.

E. Edge Blocks:

1. Elastomeric material with Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended in writing by sealant or glazing manufacturer.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.14 GLAZING ACCESSORIES FOR FIRE-RATED GLAZING PRODUCTS

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-rated glazing products with which products are used for applications and fire ratings indicated.

B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.

1. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

C. Perimeter Insulation for Fire-Rated Glazing: Product that is approved by testing agency that listed and labeled fire-rated glazing product with which it is used for application and fire rating indicated.

2.15 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit 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.

1. Allow for thermal movements from ambient and surface temperature changes acting on framing members and glazing components.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Minimum required bite.
5. Effective sealing between joints of framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glazing immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

C. For fire-rated glazing units, examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed Work.

D. For laminated-glass security glazing, examine glazing units to locate attack or threat side and protected side. Label or mark units as needed so that attack or threat side and protected side are readily identifiable. Do not leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glazing, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glazing edges from damage during handling and installation. Remove damaged glazing from Project site and legally dispose of off Project site. Damaged glazing includes glazing with edge damage or other imperfections that, when installed, could weaken glazing, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glazing manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glazing manufacturers for installing glazing lites.

F. Provide spacers for glazing lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glazing. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch-minimum bite of spacers on glazing and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glazing lites from moving sideways in glazing channel, as recommended in writing by glazing manufacturer and in accordance with requirements in referenced glazing publications.

H. Set glazing lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glazing lites with proper orientation so that coatings face exterior or interior as specified.

J. For fire-resistant glazing, set glass lites with proper orientation so that surfaces face fire side or protected side as specified.

K. For security glazing, set glazing lites with proper orientation so that surfaces face attack or threat side or protected side as specified.

1. Install attachment system continuous in glazing pocket between security glazing and frame on safe side in accordance with security glazing manufacturer's instructions and recommendations. System to be concealed below standard gasketing unless security glazing manufacturer's requirements indicate otherwise.

L. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

M. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glazing, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glazing lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glazing and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glazing lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glazing lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glazing lites and glazing stops to maintain glazing face clearances and to prevent sealant from extruding into glazing channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glazing and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glazing.

3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glazing from contact with contaminating substances resulting from construction operations. Examine glazing surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glazing, remove substances immediately as recommended in writing by glazing manufacturer. Remove and replace glazing that cannot be cleaned without damage to coatings.

C. Remove and replace glazing that is damaged during construction period.

D. Wash glazing on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glazing as recommended in writing by glazing manufacturer.

END OF SECTION 08 80 00

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Grid suspension systems for gypsum board ceilings.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Steel studs and tracks.
2. Slip-type head joints.
3. Flat strap and backing plate.
4. Cold-rolled channel bridging.
5. Hat-shaped, rigid furring channels.
6. Tie wire.
7. Hanger attachments to concrete.
8. Wire hangers.
9. Flat hangers.
10. Furring channels (furring members).
11. Isolation strip at exterior walls.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Grid suspension system for gypsum board ceilings.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.6 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association or the Steel Framing Industry Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
2. Protective Coating: ASTM A653/A653M, G40, hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C645.

1. Steel Studs and Tracks:

   a. Minimum Base-Steel Thickness: 0.0329 inch.
   b. Depth: As indicated on Drawings.
   c. Minimum Track Leg Length: 1-1/4 inches.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; with minimum track leg length of 2-1/2 inches; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Steel Thickness: 0.0538 inch.

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base-Steel Thickness: 0.0329 inch.
2. Depth: 7/8 inch.

2.3 PARTIAL WALL FRAMING CONNECTION TO FLOOR

A. Cantilevered wall system to support out-of-plane loading and transfer to the floor framing.

B. Basis-of-Design Product: Subject to compliance with requirements, provide the following product or a comparable product with equal properties:

1. Pony Wall Lite LGPW24 by ClarkDietrich Building Systems LLC.

a. Plate Material: ASTM A36 hot rolled steel

1) Thickness: 0.375 inch

b. Stud Material: ASTM A1011 SS Grade 50, 50ksi

1) Design Thickness: 0.0566 inch

c. Height: 24 inches minimum.

2.4 SUSPENSION SYSTEMS

A. Hanger Attachments to Concrete:

1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC308 as appropriate for the substrate.

a. Uses: Securing hangers to structure.
b. Type: adhesive anchor.
c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

B. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

D. Furring Channels (Furring Members):

1. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

a. Minimum Base-Steel Thickness: 0.0329 inch.

E. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Drywall Grid System.
b. CertainTeed Ceilings; 1-1/2" Drywall System.
c. USG Corporation; Drywall Suspension System.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structure, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs for opening widths less than 4 feet; install two tracks and stud head member for opening widths 4 feet and wider.

   a. Install two studs at each jamb unless otherwise indicated.

   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

D. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.6 PRE-ENCLOSURE REVIEW

A. Notify Architect prior to installing enclosing construction to allow observation of non-structural metal framing installation, including supplementary framing and blocking.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Interior trim.
2. Joint treatment materials.

B. As-Specified Data: If the product to be incorporated into Project is a specified by manufacturer name and product designation in Part 2 of this Specification Section, submit "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. Gypsum board, Type X.
2. Abuse-resistant gypsum board.
3. Mold-resistant gypsum board.
4. Cementitious backer units.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Gypsum, Saint-Gobain; Type X Gypsum Board.
b. National Gypsum Company; Gold Bond Brand Fire-Shield Gypsum Board.
c. USG Corporation; Sheetrock Brand Firecode X Panels.

2. Thickness: 5/8 inch.

3. Long Edges: Tapered.

B. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Gypsum, Saint-Gobain; Extreme Abuse Board.
b. National Gypsum Company; Gold Bond Brand Hi-Abuse XP Gypsum Board.
c. USG Corporation; Sheetrock Brand Mold Tough AR Firecode X Panels.

2. Core: 5/8 inch, Type X.

3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.

4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.

5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.

6. Long Edges: Tapered.

7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Gypsum, Saint-Gobain; M2Tech Moisture and Mold Resistant Gypsum Board Type X.
b. National Gypsum Company; Gold Bond Brand XP Fire-Shield Gypsum Board.
c. USG Corporation; Sheetrock Brand Mold Tough Panels Firecode X.

2. Core: 5/8 inch, Type X.

3. Long Edges: Tapered.

4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. National Gypsum Company; PermaBase Cement Board.
b. USG Corporation; Durock Brand Cement Board with EdgeGuard.

2. Thickness: 1/2 inch.

3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

2. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. L-Bead: L-shaped; exposed long flange receives joint compound.
d. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Sealant: As specified in Division 07 Section “Joint Sealants.”

E. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PRE-ENCLOSURE REVIEW

A. Notify Architect prior to applying panels to allow observation of framing installation, including supplementary framing and blocking.

3.3 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Stud Partition Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.4 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: All surfaces unless otherwise indicated.
2. Abuse-Resistant Type: As indicated on Drawings.
3. Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.5 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
3. Level 5:At high walls and soffits in the cafeteria.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Restore surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13 – CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Stone thresholds.
3. Waterproof membrane.
4. Metal edge strips.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.4 DEFINITIONS

A. General: Definitions in the current ANSI A108 A118, series of tile installation standards and in the current ANSI A137.1 apply to Work of this Section unless otherwise specified.
B. ISO 13007; Standards for Ceramic Tiles, Grouts and Adhesives.

1.5 PERFORMANCE REQUIREMENTS

A. Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per the DCOF AcuTest in accordance with ANSI A137.1 – 2012 standard.

1. Level Surfaces: Minimum 0.42 wet.
2. Step Treads.
3. Ramp Surfaces.

1.6 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Factory-mounted unglazed ceramic mosaic tile: CFT 1.
2. Glazed wall tile: CWT 1.
3. Glazed wall tile: CWT 2.
4. Marble thresholds.
5. Latex-portland cement mortar (thin set).
6. Latex-Portland Cement- Large and Heavy Tile mortar
7. Water-cleanable epoxy grout.
8. Trowelable underlayments and patching compounds.
9. Metal edge strips.
10. Tile cleaner.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Show base details.
2. Show locations of floor drains and sloped slabs.
3. Show threshold locations and types.
4. Show all divider strip locations control and expansion joints.

C. Samples for Verification and Initial Color Selection:

1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend**.**

2. Full-size units of each type of trim and accessory for each color and finish required.

3. Stone thresholds in 6-inch lengths.

4. Metal edge strips in 6-inch lengths.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
C. Product Certificates: For each type of product, signed by product manufacturer.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.10 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproof membrane.
3. Metal edge strips.

1.11 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tile/tile products to include in maintenance manuals.
B. Warranty: Each product warranty.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in current ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.13 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with most current ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with most current ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. ISO 13007 Standards for Ceramic Tiles, Grouts and Adhesives: Provide materials complying with ISO 13007-1, 13007-2, 13007-3, 13007-4.

D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.2 TILE PRODUCTS

A. Tile Type CFT1: Factory-Mounted Unglazed Ceramic Mosaic Tile

1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile; Division of Dal-Tile International Inc.; Keystones Mosaic or comparable product by one of the following:

a. American Olean Inc.

2. Composition: ceramic mosaic porcelain.

3. Module Size: 1 inch square – size and shape of CFT1 to be determined by pattern selection.

4. Thickness: 1/4 inch.

5. Face: Plain with cushion edges.

6. Surface: Smooth, without Slip-resistant, with abrasive admixture.

7. Tile Color and Pattern: As selected by Architect, as follows:

   a. Field Tile: Daltile Keystones, price groups 1 and 2.
   b. Accent Tile: Daltile Keystones, all price groups.
   c. Provide accent tile equal to 30 percent of total tile area, with the remainder as field tile.

8. Grout Color: As selected by Architect from manufacturer's full range.

B. Tile Type CWT 1: Glazed Wall Tile

1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile; Division of Dal-Tile International Inc.; Color Wheel Matte and Semi-Gloss or comparable product by one of the following:

   a. American Olean Inc.

2. Module Size: 4-1/4 by 4-1/4 inches.

3. Thickness: 5/16 inch.

4. Face: Plain with cushion edges.

5. Finish: Matte Semi-gloss glaze.

6. Tile Color and Pattern: As selected by Architect, as follows:

   a. Field Tile: Daltile Color Wheel Classic, price groups 1 and 2.
   b. Accent Tile: Daltile Color Wheel Classic, all price groups.
   c. Provide accent tile equal to 30 percent of total tile area, with the remainder as field tile.

7. Grout Color: As selected by Architect from manufacturer's full range.

8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

   a. Base for Portland Cement Mortar Installations: Coved, module size 4-1/4 by 4-1/4 inches.
   b. Base for Thin-Set Mortar Installations: Straight, module size 4-1/4 by 4-1/4 inches.
   c. External Corners for Portland Cement Mortar Installations: Bullnose shape with radius of at least 3/4 inch unless otherwise indicated.

d. External Corners for Thin-Set Mortar Installations: Surface bullnose, same size as adjoining flat tile.
e. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: As selected by Architect from manufacturer's full range.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Cement Based Waterproofing and Crack Isolation Membrane: Flexible mortar consisting of cement-based mix and latex additive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Laticrete Hydro Ban Cementous Waterproof Membrane.
b. MAPEI Corporation; Mapelastic 315.
c. TEC; a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.

C. Moisture Control: 2-part liquid coating.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Laticrete Vapor Ban Primer ER.
b. MAPEI Planiseal MSP.

D. Latex Based Waterproofing and Crack Isolation Membrane: fast setting, flexible, thin, load-bearing, waterproofing membrane system consisting of a premixed, quick-drying liquid latex, for installation under ceramic tile or complying with ANSI A118.10 and ANSI A118.12; and having IAMPO certification as a shower pan liner

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Laticrete International; Hydro ban
b. MAPEI- Mapelastic Aquadefense
c. Custom Building Products; Red Gard

2.5 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.

2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C 847.

a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.

b. Configuration over Solid Surfaces: Self furring.

c. Weight: 2.5 lb/sq. yd.

4. Latex Additive: Manufacturer's standard acrylic resin water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Laticrete International; Laticrete 3701 Mortar Admix or comparable product by one of the following:

1) MAPEI-Planicrete AC
2) Laticrete 3701 Fortified Mortar Bed or 3701 Admix w/226 Thick Bed Mortar.
3) TEC; a subsidiary of H. B. Fuller Company.
4) Custom Building Products

B. Latex-Portland Cement Mortar (Thin Set): ISO 13007; C2ES2P2 and ANSI A118.4.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Laticrete International; Laticrete 254 platinum or comparable product by one of the following:

   a. MAPEI- Ultra Flex 3
   b. TEC; a subsidiary of H. B. Fuller Company.
   c. Custom Building Products

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.

3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

C. Water-Cleanable, Tile-Setting Epoxy: ISO 13007; R2, ANSI A118.3.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Laticrete International; Latapoxy 300 or comparable product by one of the following:

   a. MAPEI: Keraepoxy 410
   b. TEC; a subsidiary of H. B. Fuller Company.
   c. Custom Building Products

2.6 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ISO 13007; RG and ANSI A118.3.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Laticrete International; Spectralock Pro Premium Epoxy Grout or comparable product by one of the following:

   a. MAPEI-Kerapoxy CQ
   b. TEC; a subsidiary of H. B. Fuller Company.
   c. Custom Building Products

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

1. Laticrete NXT Surface Prep Line.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products as shown but not limited to all associated required accessories, that may be incorporated into the Work include, but are not limited to, the following:

a. Schluter Systems L.P.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

1. Laticrete Stonetech Stone and Tile Cleaner.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by current ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with mortar, comply with surface finish requirements in ANSI A108.01 for installations indicated.

a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile installed with suitable products made to be trowelable with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with current ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with current TCNA's "Handbook for Ceramic Tile Installation" for current TCNA installation methods specified in tile installation schedules. Comply with parts of the current ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in current TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the current ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

a. Tile floors in wet areas.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
4. Grout coverage for tile mounted sheets must have a minimum of 2/3, verify in field prior to installation that tile tabs are no more than 1/3 of the tile height.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch.
2. Glazed Wall Tile: 1/16 inch.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated and as per all current TCNA, EJ171 standards. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above and at same width and as per current TCNA EJ171.

I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).

3.4 WATERPROOFING INSTALLATION

A. Install ANSI A118.10 waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove all grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F122-11: Thin-set mortar on waterproof membrane; TCNA F122, ANSI A108.5.

a. Tile Type: CFT1
b. Thin-Set Mortar: Latex-portland cement mortar.
c. Grout: Water-cleanable epoxy grout.

B. Interior Wall Installations:

1. Tile Installation W211: Cement mortar bed (thickset) bonded to substrate; TCA W211 and ANSI A108.1C.

a. Tile Type: CWT1
b. Bond Coat Mortar for Wet-Set Method: Latex-portland cement mortar.
c. Thin-Set Mortar for Cured-Bed Method: Latex-portland cement mortar.
d. Grout: Water-cleanable epoxy grout.

2. Tile Installation W221: Cement mortar bed (thickset) on metal lath; TCA W221 and ANSI A108.1C.

    a. Tile Type: CWT1
    b. Bond Coat Mortar for Wet-Set Method: Latex-portland cement mortar.
    c. Thin-Set Mortar for Cured-Bed Method: Latex-portland cement mortar.
    d. Grout: Water-cleanable epoxy grout.

3. Tile Installation W244: Thin-set mortar on cementitious backer units; TCA W244.

    a. Tile Type: CWT2
    b. Thin-Set Mortar: Latex-portland cement mortar.
    c. Grout: Water-cleanable epoxy grout.

END OF SECTION 09 30 13

SECTION 09 30 16 – QUARRY TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Quarry tile.
2. Waterproof membrane.
3. Metal edge strips.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.4 DEFINITIONS

A. General: Definitions in the current ANSI A108 series of tile installation standards and in the current ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Face Size: Actual tile size, excluding spacer lugs.

1.5 PERFORMANCE REQUIREMENTS

A. Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per the DCOF AcuTest in accordance with ANSI A137.1 – 2012 standard.

1. Level Surfaces: Minimum- Minimum 0.42 wet.

1.6 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Show base details.
2. Show locations of floor drains and sloped slabs.
3. Show threshold locations and types.

C. Samples for Verification and Initial Color Selection:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Stone thresholds in 6-inch lengths.
4. Metal edge strips in 6-inch lengths.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
C. Product Certificates: For each type of product, signed by product manufacturer.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.10 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproof membrane.
3. Metal edge strips.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Pre-installation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.11 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tile/tile products include in maintenance manuals.
B. Warranty: Each product warranty.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in current ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.13 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with most current ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. Current ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.

D. Low-Emitting Materials: Tile flooring systems 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."

E. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 TILE PRODUCTS

A. Tile Type QT: Unglazed square-edged quarry tile.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. American Olean; Division of Dal-Tile International Inc.; Quarry Naturals.
b. Daltile; Division of Dal-Tile International Inc.; Quarry Textures.
c. Summitville Tiles, Inc.; Quarry Tile.

2. Face Size: 6 by 6 inches.

3. Thickness: 1/2 inch.

4. Tile Color and Pattern: As selected by Architect from manufacturer's full range.

5. Grout Color: As selected by Architect from manufacturer's full range.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: As selected by Architect from manufacturer's full range.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.

1. Products: Subject to compliance with requirements, available product that may be incorporated into the Work includes, but is not limited to, the following:

a. Laticrete Hydro Ban Sheet Membrane

C. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Laticrete Hydro Ban Chemical Waterproof Membrane

2.5 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.

2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C 847.

   a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.

   b. Configuration over Solid Surfaces: Self furring.

   c. Weight: 2.5 lb/sq. yd.

4. Latex Additive: Manufacturer's standard acrylic resin water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

   a. Laticrete 3701 Fortified Mortar Bed or 3701 Admix with 226 Thick Bed Mortar

2.6 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Basis-of-Design Product: Subject to compliance with requirements, provide MAPEI Corporation; Keracolor [**S**] [**U**] or comparable product by one of the following:

   a. Laticrete High Performance Permacolor.
   b. Southern Grouts & Mortars, Inc.

2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

1. Laticrete NXT Surface Prep Line

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products as shown but not limited to all associated required accessories, that may be incorporated into the Work include, but are not limited to, the following:

a. Schluter Systems L.P.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Blanke Corporation.
b. Ceramic Tool Company, Inc.
c. Schluter Systems L.P.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

1. Laticrete Stonetech Stone and Tile Cleaner

D. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Laticrete Stonetech Heavy Duty Grout Sealer
b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer
c. MAPEI Corporation; 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
d. TEC; a subsidiary of H. B. Fuller Company; TA-257 Silicone Grout Sealer.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with bonded mortar bed comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with suitable products made to be trowelable for leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with current TCNA's "Handbook for Ceramic Tile Installation" for current TCNA's installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the most current ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

    a. Tile floors in wet areas.
    b. Tile floors composed of tiles 8 by 8 inches or larger.
    c. Tile floors composed of rib-backed tiles.
    d. Tile installed on exterior surfaces

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Quarry Tile: 1/4 inch.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated and as per all current TCNA, EJ171 standards. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them at same width and as per current TCNA EJ171.

I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).

2. Do not extend waterproofing under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing with elastomeric sealant.

J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOFING INSTALLATION

A. Install ANSI A118.10 waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR QUARRY TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F114: Cement mortar bed (thickset) with cleavage membrane; epoxy grout; TCA F114 and ANSI A108.1B.

a. Thin-Set Mortar for Cured-Bed Method: Latex-portland cement mortar.
b. Grout: Water-cleanable epoxy grout.

END OF SECTION 09 30 16

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.3 DEFINITIONS

A. CAC: Ceiling Attenuation Class.
B. LR: Light Reflectance.
C. NRC: Noise Reduction Coefficient.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Attachment devices.
2. Wire hangers, braces and ties.
3. Hanger rods.
4. Flat hangers.
5. Angle hangers.
6. Hold-down clips.
7. Roll-formed, sheet-metal edge moldings and trim.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. Acoustical panels for ceiling type A1, A2, A3 and A4.
2. Metal suspension system for ceiling types A1, A2, A3, and A4.
3. Extruded-aluminum or roll-formed, steel sheet metal edge moldings and trim.

C. Samples for Verification: If proposing products other than those specifically named in Part 2 of this Section, for each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of 6-inch-square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.7 INFORMATIONAL SUBMITTALS

A. 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-system members.

2. Structural members to which suspension systems will be attached.

3. Method of attaching hangers to building structure.

4. Items penetrating finished ceiling and ceiling-mounted items including the following:

a. Lighting fixtures.
b. Diffusers.
c. Grilles.
d. Speakers.
e. Sprinklers.
f. Access panels.
g. Detectors.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.9 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. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed of each acoustical panel type.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed of each metal suspension system type.
3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Match each type of acoustical ceiling panel with a supporting suspension system of the same manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

B. Color: White**.**

C. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

2.4 STANDARD ACOUSTICAL PANELS FOR WIDE-FACE SUSPENSION SYSTEMS

A. Acoustical Panels for Ceiling Type A1

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to:

    a. Armstrong World Industries, Inc.; Tundra 301.
    b. CertainTeed Ceilings; School Board FFSB-157.
    c. USG Corporation; Touchstone Panels 5893.

2. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.

3. Pattern: As indicated by manufacturer's designation.

4. Modular Size: 24 by 24 inches.

5. Thickness: 5/8 inch.

6. Edge Detail: Square.

7. NRC: Not less than 0.50.

8. CAC: Not less than 30.

9. LR: Not less than 0.80.

10. Recycled Content: Not less than 30 percent.

B. Acoustical Panels for Ceiling Type A2

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to:

    a. Armstrong World Industries, Inc.; School Zone Fine Fissured 1713.
    b. CertainTeed Ceilings; Fine Fissured High NRC HHF-457 HNRC.
    c. USG Corporation; Radar High-NRC Panels 22111.

2. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.

3. Pattern: As indicated by manufacturer's designation.

4. Modular Size: 24 by 24 inches.

5. Thickness: 3/4 inch.

6. Edge Detail: Square.

7. NRC: Not less than 0.70.

8. CAC: Not less than 35.

9. LR: Not less than 0.80.

10. Recycled Content: Not less than 40 percent.

C. Acoustical Panels for Ceiling Type A3

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to:

   a. Armstrong World Industries, Inc.; Ultima Lay-In 1910.
   b. CertainTeed Ceilings; Symphony m 1222-75-1.
   c. USG Corporation; Mars Panels 86185.

2. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted.

3. Pattern: As indicated by manufacturer's designation.

4. Modular Size: 24 by 24 inches.

5. Thickness: 3/4 inch.

6. Edge Detail: Square.

7. NRC: Not less than 0.75.

8. CAC: Not less than 35.

9. LR: Not less than 0.90.

10. Recycled Content: Not less than 60 percent.

2.5 SPECIALTY ACOUSTICAL PANELS FOR WIDE-FACE SUSPENSION SYSTEMS

A. Acoustical Panels for Ceiling Type A4:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to:

   a. Armstrong World Industries, Inc.; Kitchen Zone 673.
   b. USG Corporation; Kitchen Lay-In Panels 3210.

2. Type and Form: Type IX, mineral-base panels with scrubbable pigmented or clear finish; Form 2, water felted.

3. Pattern: As indicated by manufacturer's designation.

4. Modular Size: 24 by 24 inches.

5. Thickness: 5/8 inch.

6. Edge Detail: Square.

7. CAC: Not less than 30.

8. LR: Not less than 0.85.

9. Recycled Content: Not less than 20 percent.

2.6 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.

1. High-Humidity Finish: For Type A4, provide coating tested and classified for "severe environment performance" according to ASTM C635/C635M.

2.7 WIDE-FACE METAL SUSPENSION SYSTEMS

A. Wide-Face Suspension System for Ceiling Types A1, A2, A3, and A4:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Armstrong World Industries, Inc.; Prelude XL 15/16-inch Exposed Tee System.
   b. CertainTeed Ceilings; 15/16-inch EZ Stab Classic System.
   c. USG Corporation; Donn Brand DX Acoustical Suspension System.

2. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.

3. Structural Classification: Intermediate-duty system.

4. End Condition of Cross Runners: Override (stepped) type.

5. Face Design: Flat, flush.

6. Cap Material: Cold-rolled steel.

7. Cap Finish: Painted white.

2.8 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.

    a. Type: Postinstalled expansion or Postinstalled bonded anchors.
    b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
    c. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
    d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.

2. Stainless-Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.

3. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

F. Hold-Down Clips: Manufacturer's standard hold-down.

2.9 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.

2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

B. Extruded-Aluminum or Roll-Formed Steel Sheet-Metal Edge Moldings and Trim: Where indicated for ceiling clouds or fasciae, provide manufacturer's extruded-aluminum or roll-formed steel sheet-metal edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Axiom Classic Trim.
b. USG Corporation; Compasso Suspension Trim.

2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.10 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Division 07 Section " Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Lay out openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C636/C636M and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Secure flat, angle, channel, and rod hangers to structure by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

8. Do not attach hangers to steel deck tabs.

9. Do not attach hangers to steel roof deck. Attach hangers to structural members.

10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3. Install hold-down clips in vestibules; space according to panel manufacturer's written instructions unless otherwise indicated.

    a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and restored to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Resilient base: rubber RB.
2. Reducers.
3. Edge guards.
4. Adapters.
5. Nosing for resilient floor coverings.
6. Trowelable leveling and patching compounds.
7. Concrete slab primer.
8. Adhesives.

B. Samples for Verification and Initial Color Selection:

1. For each type of product indicated, in manufacturer's standard-size Samples but not less than 2-1/2 inches long, of each resilient product color, texture, and pattern required.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.6 QUALITY ASSURANCE

A. Source Limitations for Resilient Base and Accessories: Obtain each type of resilient base and accessories from a single source with resources to provide materials of consistent quality in appearance and physical properties.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.
B. Warranty: Each product warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F or more than 90 deg F.

1.9 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 90 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 90 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE: RUBBER (RB)

A. Resilient Base:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. Mannington Commercial; Premium Rubber Edge.
b. Johnsonite; Rubber Wall Base.
c. Roppe Corporation, USA; Pinnacle Series Rubber Wall Base

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length, not less than 100 feet.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

1. Basis-of-Design Products: Subject to compliance with requirements, provide the following Ardex product or a comparable product:

a. Portland Cement-Based Flash Patching and Skim Coating: SD-F Feather Finish.
b. Portland Cement-Based Patching: SD-P Insta Patch.
c. Portland Cement-Based Self-Leveling Underlayment: K-10/K-60 Self-Leveling Underlayment Concrete.

B. Concrete Slab Primer: Non-staining type recommended by resilient accessories manufacturer.

C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24**).**

2. Adhesives 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."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

   b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners- using manufactures approved methods and tools:

   1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.

   2. Inside Corners: Use straight pieces of maximum lengths possible. Use scribing and cutting measures approved by base manufacturer. Inside corners that are not scribed to fit will be rejected.

3. Use Crane #532 top-set gouger tool for all required for tight wrap and curved corners.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
4. Do not wash floor until after the period recommended by manufacturer.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luxury vinyl floor tile
2. Solid vinyl floor tile.
3. Vinyl composition floor tile.
4. Movement joint.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Luxury vinyl tile LVT
2. Solid Vinyl Tile - SVT
3. Vinyl composition floor tile VCT.
4. Trowelable leveling and patching compounds.
5. Concrete slab primer.
6. Adhesives.
7. Movement Joint
8. Floor polish.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of patterns.
2. Show base details.
3. Show locations of divider strips, control, and expansion joints.
4. Show locations of floor drains and sloped slabs.
5. Show threshold locations and types.

C. Samples for Verification and Initial Color Selection: Full-size units of each color and pattern of floor tile required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.
B. Warranty: Each product warranty.

1.7 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Source Limitations for Resilient Tile: Obtain each type of resilient tile from a single source with resources to provide materials of consistent quality in appearance and physical properties.

C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for floor tile including accessories.

a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.

E. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to resilient tile flooring including, but not limited to, the following:

a. Construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress.
b. Materials, substrate preparation, material application, sequencing, and tolerances.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.10 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 90 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 90 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore Standard.

B. Low-Emitting Materials: Flooring system 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."

2.2 HIGH PERFORMANCE LUXURY VINYL TILE -LVT

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Tarkett: iD Latitude Abstract, Stone and Woods- Planks and tiles.

B. Tile Standard: ASTM F 1700.

1. Class: Class III, printed film vinyl tile.
2. Type: Type B, embossed surface.

C. Thickness: 3.0mm.

D. Size: 6” x 36”, 18” x 18”

E. Colors and Patterns: As selected by Architect from full range of industry colors, up to 4 colors per building.

F. Warranty: Limited 20-Year Commercial Warranty

2.3 SOLID VINYL TILE -SVT

A. Basis of design product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Patcraft: NuMix I768V

B. Tile Standard: ASTM F 1700

1. Class 1 – monolithic solid vinyl tile Type A (smooth)

C. Size: 36 in x 36 in

D. Colors: As selected by Architect from full range

E. Pattern: As shown on drawings.

F. Performance Testing:

1. Static Load / ASTM F970: Passes
2. Radiant Panel / ASTM E648: Passes, Class 1
3. Smoke Density / ASTM E662
4. Coefficient of Friction (ASTM D2047): Greater than or equal to 0.5. ADA Compliant.

G. Warranty: 25 Year Commercial Limited Warranty.

2.4 VINYL COMPOSITION FLOOR TILE: VCT

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Field Tile:

a. Armstrong World Industries, Inc.; Standard Excelon Imperial Texture (including Imperial Texture Classics) and Standard Excelon MultiColor.
b. Johnsonite Flooring – the Azrock collection, (including standard, textile and solids collections).

2. Accent Tile 30%:

a. Armstrong World Industries, Inc.; Standard Excelon Imperial Texture (including Imperial Texture Classics), Standard Excelon MultiColor, and Standard Excelon Rave.

b. Johnsonite Flooring – the Azrock collection, (including standard, textile and solids collections).

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch, 1/8inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: As selected by Architect from full range of industry colors.

1. Provide accent tile equal to 30 percent of total vinyl composition floor tile area, with the remainder as field tile.

G. Warranty: 30 Year Commercial Limited Warranty.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

1. Basis-of-Design Products: Subject to compliance with requirements, provide the following Ardex product or a comparable product:

a. Portland Cement-Based Flash Patching and Skim Coating: SD-F Feather Finish.
b. Portland Cement-Based Self-Leveling Underlayment: K-10/K60 Self-Leveling Underlayment Concrete.

B. Concrete Slab Primer: Non-staining type recommended by resilient tile flooring manufacturer.

C. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated, and to ensure warranty guidelines are followed.

1. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. VCT Adhesives: Not more than 50 g/L.
b. Rubber Floor Adhesives: Not more than 60 g/L.

2. Adhesives 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. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer, containing not less than 16 to 25 percent solids.

2.6 METAL MOVEMENT JOINT

A. Metal Movement Joint: Surface joint profile to match tile and setting-bed thickness, Aluminum or Stainless steel with soft thermoplastic rubber movement zone. Profile and thickness to be determined per material specified.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Schluter Systems L. P. – Dilex Movement Joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

        1) At a minimum, test concrete substrates in at least 3 locations in separate parts of the floor for applications of 2000 square feet or less; provide one additional test location for each additional 1000 square feet, or fraction thereof.

    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Wood Subfloors:

1. Verify that underlayment over subfloor complies with requirements in Section 06 16 00, "Sheathing."
2. Verify underlayment surface is free of surface irregularities and substances with potential to interfere with adhesive bond, show through surface, or stain tile.

D. Existing Floors: Condition of existing subfloor is unknown prior to removal of existing flooring. If, after removal of existing flooring, subfloor requires leveling, patching, or filling, notify Architect in writing.

1. Asbestos Abatement Areas: In areas where removal of existing flooring is included in asbestos abatement procedures, coordinate with entity responsible for abatement to ensure patching and repair is compatible with requirements for installation of resilient tile flooring.

E. Comply with resilient tile manufacturer's written instructions to prepare substrates.

1. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

2. Ensure patching and repair materials are compatible with resilient tile.

3. Levelness Tolerances: Apply patching and repair materials to provide levelness of floor substrate within 1/4 inch in 10 feet unless more stringent levelness is recommended or required by resilient tile manufacturer.

4. Flash Patching and Skim Coating: Apply flash patching material to areas with 1/8 inch or less depression.

5. Patching: Apply patching material to areas with 1/8 inch or greater depression.

6. Self-Leveling Underlayment: Apply self-leveling material to areas where flash patching and patching described above cannot provide smooth, level surface acceptable to receive resilient tile flooring.

F. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor 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 tile at perimeter.

1. Lay tiles in pattern indicated.

C. Laser cut Murals: Provide laser cut murals as indicated on drawings.

1. Artwork for Mural location is as shown on Architectural drawings. Mural to be laser cut/etched will be submitted to manufacture as a file during construction. Mural is to be provided by client.

2. Full color computer drawing from manufacture, will be submitted to designer for full approval including all mounting and assembly instructions.

3. Deliver mural to site with dot mounted backing, paper faced and numbered for easy installation. Contractor to provide proper storage until installation.

D. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles as follows: 12” x 12”

a. Field Tile: With grain running in one direction with grain direction alternating in adjacent tiles (basket-weave pattern) in pattern of colors and sizes indicated.
b. Accent Tile: With grain running in one direction with grain direction alternating in adjacent tiles (basket-weave pattern) in pattern of colors and sizes indicated.

E. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

F. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

H. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

I. Apply concrete slab primer, if recommended by resilient tile manufacturer, prior to applying adhesive. Apply according to manufacturer's written instructions.

J. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
4. Do not wash floor until after the period recommended by resilient tile manufacturer.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.

E. Cover floor tile until Substantial Completion.

F. Perform the following operations in each area of Project upon completion of floor installation and as recommended by manufacturer.

1. Vinyl Composition Floor Tile:

a. Scrub floor with a neutral detergent solution at 4 to 6 oz per gallon. Scrub floor using pads or brushes as recommended by vinyl composition floor tile manufacturer.

b. Use stripping solutions at badly soiled or scratched areas, as recommended by vinyl composition floor tile manufacturer.

c. Thoroughly rinse floor, wet vacuum, and dry floor. Floor must be free from all dust, dirt and any particles that may become lodged in final polish application.

d. Apply five coats of commercial floor polish. Apply each coat as recommended by product manufacturer.

END OF SECTION 09 65 19

SECTION 09 66 23 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thin-set, epoxy-resin matrix terrazzo flooring – poured epoxy
2. Epoxy-resin matrix terrazzo base - Precast.

1.3 DEFINITIONS

A. Aggregate: Marble, Glass and Granite chips.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to terrazzo including, but not limited to, the following:

a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress.
c. Review special terrazzo designs and patterns.

1.5 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Thin-set, epoxy-resin matrix terrazzo flooring- poured epoxy.
2. Epoxy- resin matrix terrazzo base- precast.
3. Thin-set divider strips.
4. Control-joint strips.
5. Accessory strips.
6. Strip adhesive.
7. Anchoring devices.
8. Patching and fill material.
9. Joint compound.
10. Resinous matrix terrazzo cleaner.
11. Sealer.

B. Shop Drawings: Submit set of drawings showing complete floor patterns in all areas indicated on Drawings to receive terrazzo. Submit drawings for Architect review prior to starting installation. Shop drawings are to including but not limited to:

1. Floor plans showing all patterns, precast base locations and details.
2. Layouts showing locations of divider strips, control and expansion joints.
3. Locations of all floor drains including sloped slab locations.
4. Marble threshold location.
5. Photocopies of Tetra Tech documentation not acceptable.
6. Divider strips.
7. Control-joint strips.
8. Accessory strips.
9. Abrasive strips.
10. Precast terrazzo jointing and edge configurations.
11. Terrazzo patterns.

C. Samples for Verification and Initial Color Selection: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:

1. Poured Terrazzo: 6-inch-square Samples.
2. Precast Terrazzo: 6-inch-square Samples.
3. Accessories: 6-inch-long Samples of each exposed strip item required.
4. NTMA color plates showing the full range of colors and patterns available for each terrazzo type

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Retain "Material Certificates" Paragraph below to require submittal of material certificates from manufacturers.
C. Material Certificates: For each type of terrazzo material or product, from manufacturer.
D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For terrazzo/terrazzo products to include in maintenance manuals.
B. Warranty: Each product warranty.

1.9 QUALITY ASSURANCE

A. Installer Qualifications:

1. Engage an installer who is a contractor member of NTMA.
2. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.

B. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for terrazzo including accessories.

a. Size: Minimum 100 sq. ft. of typical poured-in-place flooring condition for each color and pattern in locations directed by Architect.
b. Include base.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.

B. Retain "Field Measurements" Paragraph below for precast terrazzo.

C. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.

D. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

E. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.

F. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

B. Retain "FloorScore Compliance" Paragraph below if required for LEED-NC, LEED-CS, or LEED-CI Credit IEQ 4.3.

C. FloorScore Compliance: Terrazzo floors shall comply with requirements of FloorScore Standard.

D. Retain "Low-Emitting Materials" Paragraph below if required for LEED for Schools Credit IEQ 4.

E. Low-Emitting Materials: Flooring system 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."

2.2 EPOXY-RESIN MATRIX TERRAZZO-POURED EPOXY

A. Thin-set, Epoxy-Resin Matrix Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. General Polymers Corporation; Terrazzo 1100.
b. Key Resin Company; Key Epoxy Terrazzo.
c. Master Terrazzo Technologies LLC; Morricite.
d. TEC Specialty Construction Brands, Inc.; Tuff-Lite Epoxy Terrazzo.
e. Terrazzo & Marble Supply Companies; Terroxy Resin Systems.

2. Thickness: 3/8 inch nominal.

3. Formulated Mix Color and Pattern: To match existing or As selected by Architect from NTMA terrazzo plates.

4. Custom Mix Color and Pattern: Match Architect's sample Match existing.

5. Aggregate and Matrix colors to be selected by architect. Matrix color to be selected from entire line of Sherwin Williams colors.

B. Materials:

1. Crack Isolation Membrane with Scrim: A two component, 100 percent solid flexible epoxy membrane applied at 40 square feet per gallon, yielding 40 mils in thickness. Provide Crack Isolation Membrane over 100% of surface to be covered with epoxy flooring- all floor levels. Provide scrim over all new and existing cracks as per manufactures recommendations. For all second and third floor applications, provide scrim over 100% of surface to be covered with epoxy flooring.

a. Similar to “Epoflex” by General Polymers, Cincinnati Ohio.

2. Primer: Manufacturer's product recommended for substrate and use indicated.

3. Thin-set Epoxy-Resin Matrix-Poured Epoxy: Manufacturer's standard recommended for use indicated and in color required for mix indicated.

a. Physical Properties without Aggregates:

1) Hardness: 60 to 85 per ASTM D 2240, Shore D.

2) Minimum Tensile Strength: 3000 psi per ASTM D 638 for a 2-inch specimen made using a "C" die per ASTM D 412.

3) Minimum Compressive Strength: 10,000 psi per ASTM D 695, Specimen B cylinder.

4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.

a) Distilled water.
b) Mineral water.
c) Isopropanol.
d) Ethanol.
e) 0.025 percent detergent solution.
f) 1.0 percent soap solution.
g) 10 percent sodium hydroxide.
h) 10 percent hydrochloric acid.
i) 30 percent sulfuric acid.
j) 5 percent acetic acid.

b. Physical Properties with Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide"; comply with the following:

1) Flammability: Self-extinguishing, maximum extent of burning 1/4 inch per ASTM D 635.
2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F for temperature range of minus 12 to plus 140 deg F per ASTM D 696.

4. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.

a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
b. 24-Hour Absorption Rate: Less than 0.75 percent.
c. Dust Content: Less than 1.0 percent by weight.

5. Finishing Grout: Resin based.

2.3 EPOXY-RESIN MATRIX TERRAZZO BASE- PRECAST

A. Epoxy Resin Matrix Terrazzo Base- Precast: Minimum 3/8-inch-thick, reinforced epoxy resin matrix terrazzo base- precast cast in maximum lengths possible, but not less than 36 inches. Comply with NTMA's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.

1. Type: Refer to details.
2. Top Edge: Radius edge with polished top surface.
3. Outside Corner Units: With finished returned edges at outside corner.
4. Aggregate and Matrix colors to be selected by architect. Matrix color to be selected from entire line of Sherwin Williams colors.

2.4 STRIP MATERIALS

A. Thin-Set Divider Strips: L-type angle, 1/4 inch deep.

1. Material: Brass.
2. Top Width: 1/4 inch.

B. Heavy-Top Divider Strips: L-type angle in depth required for topping thickness indicated.

1. Bottom-Section Material: Matching top-section material.
2. Top-Section Material: Brass.
3. Top-Section Width: 1/4 inch.

C. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.

D. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:

1. Base-bead strips for exposed top edge of terrazzo base.
2. Edge-bead strips for exposed edges of terrazzo.

2.5 MISCELLANEOUS ACCESSORIES

A. Anchoring Devices:

1. Precast Epoxy Resin Matric Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.

B. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.

C. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.

D. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.

E. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
2. Acid-Base Properties: With pH factor between 7 and 10.
3. Sealers shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.
C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.

B. Concrete Slabs:

1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.

b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.

c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.

C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

1. Moisture Testing: Perform tests indicated below.

a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

1) Perform tests so that each test area does not exceed 200 sq. ft., and perform not less than two tests in each installation area and with test areas evenly spaced in installation areas.

b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.

c. Proceed with installation only after substrates pass testing.

D. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.

1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

3.3 EPOXY-RESIN MATRIX TERRAZZO INSTALLATION- POURED EPOXY

A. Comply with NTMA's written recommendations for terrazzo and accessory installation.

B. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."

C. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet; noncumulative.

D. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.

E. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

F. Flexible Reinforcing Membrane:

1. Prepare and prefill substrate cracks with membrane material.
2. Install membrane to produce full substrate coverage in areas to receive terrazzo.
3. Reinforce membrane with fiberglass scrim at substrate cracks and at all slabs other than slabs-on-grade.
4. Prepare membrane according to manufacturer's written instructions before applying substrate primer.

G. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.

H. Strip Materials:

1. Divider and Control-Joint Strips:

a. Locate divider strips in locations indicated.

b. Install control-joint strips back to back directly above concrete-slab control joints.

c. Install control-joint strips with 1/4-inch gap between strips, and install sealant in gap.

d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.

2. Accessory Strips: Install as required to provide a complete installation and in locations indicated.

3. Abrasive Strips: Install with surface of abrasive strip positioned 1/16 inch higher than terrazzo surface.

3.4 EPOXY RESIN MATRIX TERRAZZO INSTALLATION BASE-PRECAST

A. Install epoxy resin matrix terrazzo base-precast, using method recommended by NTMA and manufacturer unless otherwise indicated.
B. Do not install base-precast, that are chipped, cracked, discolored, or not properly finished.
C. Seal joints between base-precast, with joint compound matching precast terrazzo matrix.

3.5 REPAIR

A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.6 CLEANING AND PROTECTION

A. Cleaning:

1. Remove grinding dust from installation and adjacent areas.

2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.

B. Sealing:

1. Seal surfaces according to NTMA's written recommendations.
2. Apply sealer according to sealer manufacturer's written instructions.

C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 66 23

SECTION 09 84 33 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes shop-fabricated, fabric-wrapped panel units tested for acoustical performance, including:

1. Sound-absorbing wall panels.

1.3 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of fabric facing, panel edge, core material, and mounting indicated.

1. Sound-absorbing wall panel.
2. Core materials.
3. Facing material.
4. Mounting devices.

B. Shop Drawings: For sound-absorbing wall units. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.

1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.

C. Samples for Verification and Initial Color Selection: For the following products, prepared on samples of size indicated below:

1. Fabric: Full-width by approximately 36-inch-long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.

2. Panel Edge: 12-inch-long Sample(s) showing each edge profile, corner, and finish.

3. Core Material: 12-inch-square Sample at corner.

4. Mounting Devices: Full-size Samples.

5. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor covering to include in maintenance manuals.
B. Warranty: Each product warranty.

1.7 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: 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. Electrical outlets, switches, and thermostats.

2. Items penetrating or covered by sound-absorbing wall units including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Alarms.
e. Sprinklers.
f. Access panels.

3. Show operation of hinged and sliding components covered by or adjacent to sound-absorbing wall units.

B. Product Certificates: For each type of sound-absorbing wall unit, from manufacturer.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sound-absorbing wall units to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

B. Warranty: Executed special warranty.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 yards.
2. Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than five devices, including unopened adhesives.

1.10 QUALITY ASSURANCE

A. Source Limitations: Obtain sound-absorbing wall units from single source from single manufacturer.

B. Fire-Test-Response Characteristics: Provide sound-absorbing wall units meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 and NFPA 286.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

1. Build mockup of typical wall area as directed by Architect.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Preinstallation Conference: Conduct conference at Project site.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and sound-absorbing wall unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.12 PROJECT CONDITIONS

A. Environmental Limitations: Do not install sound-absorbing wall units until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install sound-absorbing wall units until a permanent level of lighting is provided on surfaces to receive the units.

C. Air-Quality Limitations: Protect sound-absorbing wall units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of sound-absorbing wall units and actual dimensions of openings and penetrations by field measurements before fabrication.

1.13 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sound-absorbing wall units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:

    a. Acoustical performance.
    b. Fabric sagging, distorting, or releasing from panel edge.
    c. Warping of core.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOUND-ABSORBING WALL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Conwed Designscape; an Owens Corning company.
2. Kinetics Noise Control, Inc.
3. Unika Vaev.

B. General Requirements for Sound-Absorbing Wall Units: Units 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. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core and bonded or attached to edges and back of frame.

1. Basis-of-Design Product: Kenetics Noise Control, Hardside Acoustical Wall Panels, or approved equal.

2. Mounting: Edge mounted with splines secured to substrate.

a. Finish Color at Exposed Edges: As selected by Architect from manufacturer's full range.

3. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.

4. Core: glass-fiber board.

a. Core-Face Layer: Manufacturer's standard tackable, impact-resistant, high-density board.

5. Edge Construction: Manufacturer's standard chemically hardened core with no frame.

6. Edge Profile: Square.

7. Corner Detail in Elevation: Square with continuous edge profile indicated.

8. Reveals between Panels: As selected by Architect from manufacturer's full range.

9. Acoustical Performance: Sound absorption NRC of not less than 0.65 according to ASTM C 423 for Type A mounting according to ASTM E 795.

10. Nominal Overall Panel Thickness: 1 inch.

11. Panel Width: As indicated on Drawings.

12. Panel Height: As indicated on Drawings.

D. Facing Material: Facing Material: Fabric from same dye lot; color and pattern as selected by Architect from manufacturer's full range.

1. Manufacturer: Guilford of Maine.
2. Product Line/Pattern: Anchorage 2335.
3. Pattern Repeat: None.
4. Color: to be selected by architect from manufactures full range of colors.
5. Fiber Content: 100 percent woven polyester.
6. Width: 66 inches.

2.2 MATERIALS

A. Core Materials:

1. Glass-Fiber Board: ASTM C 612, Type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2. Fire-Retardant Formed Plastic: Manufacturer's standard formed plastic with flame-spread index of 25 or less and smoke-developed index of 25 or less according to ASTM E 84.

3. Tackable, Impact-Resistant, High-Density Board for Face Layer: 1/8-inch- thick layer of compressed molded glass-fiber board with a nominal density of 16 to 18 lb/cu. ft. laminated to face of core.

B. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:

1. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

2.3 FABRICATION

A. General: Use manufacturer's standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

1. Glass-Fiber Board Cores: Chemically harden core edges and areas of core where mounting devices are attached.

B. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.

C. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.

1. Square Corners: Tailor corners.
2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.

D. Dimensional Tolerances of Finished Units: Plus, or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.
5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, fabricated units, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of sound-absorbing wall units.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install sound-absorbing wall units in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with sound-absorbing wall unit manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

C. Align and level fabric pattern and grain among adjacent units.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus, or minus 1/16 inch.
B. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.
B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 09 84 33

SECTION 09 91 00 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and application of paint systems, for the following:

1. Exterior applications.

2. Interior applications.

a. Painting systems indicated on Drawings and in Schedules applied to new and existing exterior and interior surfaces and related components including but not limited to items such as hollow metal doors frames, doors, access doors, trim pieces, window sash, trim and previously painted cabinet heater/fin tube enclosures, exposed ductwork etc., unless otherwise indicated, including appropriate surface preparation for all new or existing surfaces to be painted including previously painted surfaces and surfaces with existing wall coverings

B. Section includes surface preparation and application of wood finishes.

1. Wood Refinishing as indicated on Drawings and in Schedules applied to new and existing interior surfaces and related components including but not limited to items such as door frames, doors, access doors, trim and molding pieces, window sash and trim, wood panel walls and doors etc., unless otherwise indicated, including appropriate surface preparation for all new or existing surfaces to be refinished including previously painted surfaces and surfaces with existing wall coverings.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product for substrates indicated. Include preparation requirements and application instructions. Include all paint products under one cover sheet.

1. Exterior CMU (painted).
2. Exterior CMU (stained).
3. Exterior steel.

4. Exterior galvanized-metal.
5. Exterior aluminum (where indicated).
6. Exterior wood (bleeding woods and knots).
7. Exterior wood (non-bleeding woods).
8. Exterior fiber cement siding.
9. Exterior portland cement (stucco).
10. Exterior exposed metal trim at portland cement (stucco).
11. Exterior exposed PVC
12. Exterior EFIS
13. Exterior Brick
14. Interior CMU.
15. Interior CMU (deep tone accent colors).
16. Interior steel.
17. Interior steel (deep tone accent colors).
18. Interior previously painted cabinet heater/fin tube enclosures.
19. Interior steel piping, piping supports and hangers.
20. Interior galvanized-metal (metal deck).
21. Interior galvanized metal (metal deck, deep tone accent colors).
22. Interior aluminum (where indicated).
23. Interior wood.
24. Interior wood (deep tone accent colors).
25. Interior fiberglass reinforced polyester (FRP).
26. Interior plaster.
27. Interior plaster (deep tone accent colors).
28. Interior gypsum board.
29. Interior gypsum board (deep tone accent colors).
30. Interior stained wood (closed or open grain).
31. Interior stained wood (closed or open grain).

B. Samples for Verification and Initial Color Selection: For each type of finish system and in each color and gloss of finish indicated.

1. Submit Samples on rigid backing, 8 inches square.

    a. For wood finishes, submit Samples on representative samples of actual wood substrates, 8 inches square.

2. Step coats on Samples to show each coat required for system.

3. Label each coat of each Sample.

4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content. Tints and /or colorant shall add no additional VOC to final product. Provide 3rd party certification of VOC content.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For applicator.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 10 percent, but not less than 1 gal. of each material and color applied.
2. Stains and Transparent Finishes: 10 percent, but not less than 1 gal. of each material and color applied.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of paint to include in maintenance manuals.

B. Warranty: Each product warranty.

C. Coatings Maintenance Manual:

1. Upon conclusion of the project, the contractor or paint manufacture/supplier shall furnish a coatings maintenance manual such as Sherwin Williams “Custodian Project Color and Product Information” report. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions. Touch up procedures and color samples of each color and finish used. All information contained in a self-bound 3 ring hole punched catalog.

1.8 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual, experienced in applying finishes specified in this Section, who has successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; familiar with special requirements indicated; and with sufficient trained staff to apply manufacturer's products according to specified requirements.

B. Mockups: Apply mockups of each finish system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each finish system specified in Part 3.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.10 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Do not apply exterior finishes in snow, rain, fog, or mist.
D. Lighting: Do not install finishes until a lighting level of not less than 80 fc is provided on the surfaces to receive finishing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.
3. Sherwin-Williams Company (The).

B. Submittals containing manufactures other than stated above, will require a product by product comparison for each type of paint. All Comparable equals are to be matched with corresponding Sherwin Williams specified products.

C. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in Part 3 articles for the application indicated.

2.2 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

3. Provide products of same manufacturer for each coat in a finish system.

4. "All-in-one" paint and primer products are not acceptable.

B. VOC Compliance: All paint products shall meet New York requirements for Volatile Organic Compound (VOC) and Ozone Transport Commission (OTC) regulations, January 2005.

C. Colors: As selected by Architect from manufacturer's full range.

1. 25 percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

a. Concrete: 12 percent.
b. Masonry (Clay and CMU): 12 percent.
c. Wood: 15 percent.
d. Gypsum Board: 12 percent.
e. Plaster: 8 percent.

B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Plaster Substrates: Verify that plaster is fully cured.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

B. Clean substrates of substances that could impair bond of finishes, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce finish systems indicated.

C. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following**:**

1. SSPC-SP 3, "Power Tool Cleaning."
2. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Galvanized Metal/Galvanized Deck, Factory Primed Surface-Coordinate with approved paint manufacture on compatibility of paint finish coats to factory prime surface.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer apply coat of knot sealer recommended in writing by topcoat manufacturer for coating system indicated.
2. Apply wood filler paste to open-grain woods to produce smooth, glasslike finish.
3. Sand surfaces that will be exposed to view and dust off.
4. Prime edges, ends, faces, undersides, and back sides of wood.
5. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

L. Alteration Work: Comply with applicable surface preparation requirements specified and as recommended by finish materials manufacturer for existing surfaces to receive paint or other finishes, including cleaning, sanding, and roughening as required for proper adherence of new finish material.

1. Existing Woodwork: Strip existing wood finish to bare wood using commercially available solvents compatible with finish. Use in strict accordance with manufacturer's printed instructions. After stripping operation is complete and surface is dry, sand surface with sandpaper, using random orbital sanding machine.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for finish and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

4. Do not apply paints over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

E. Alterations: Finish new surfaces adjacent to unaltered existing surfaces with finish of same type and surface texture as corresponding adjacent surfaces, unless otherwise indicated. Finish patched, damaged, or extended surfaces to match existing surfaces.

F. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, pipe and insulation having cotton or canvas insulation covering or another paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or another paintable jacket material.
h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. CMU Substrates (Painted):

1. First Coat:

    a. Benjamin Moore & Co.; Ultra-Spec Int/Ext Hi Build Block Filler 0609.
    b. PPG Paints; Speedhide Interior/Exterior Latex Block Filler 6-7.
    c. Sherwin-Williams Company (The); Prep Rite Latex Block Filler B25W25.

2. Second and Third Coats:

    a. Benjamin Moore & Co.; N447 Ultra Spec Exterior Flat Acrylic.
    b. PPG Paints; Speedhide Interior/Exterior Flat Acrylic Latex 6-610.
    c. Sherwin-Williams Company (The); A100 Latex Flat House Paint A6.

B. CMU Substrates (Stained):

1. First, Second and Third Coats:

    a. Benjamin Moore & Co.; Insl-X Tuffcrete WB Concrete Stain CST 2XXX.
    b. PPG Paints; Perma-Crete Color Seal Acrylic Concrete Stain 4-4210 Series.
    c. Sherwin-Williams Company (The); H & C ColorTop Concrete Stain Solid Color Water based 111.08 Concrete Stain.

C. Steel Substrates:

1. First Coat:

    a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
    b. PPG Paints; Inc.; Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
    c. Sherwin-Williams Company (The); Pro Industrial Pro-Cryl® Universal Primer; B66 Series at 1.9-3.8 mils DFT.

2. Second and Third Coats:

    a. Benjamin Moore & Co.; Ultra Spec HP DTM Acrylic Gloss, HP28 or S/G Enamel HP29.
    b. PPG Paints; Inc.; Pitt-Tech Industrial DTM Acrylic Gloss 90-374.
    c. Sherwin-Williams Company (The); Pro Industrial™ Waterbased Alkyd Urethane Enamel Semi-Gloss; B53 Series at 1.4-1.7 DFT

D. Galvanized-Metal Substrates:

1. First Coat:

    a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
    b. PPG Paints; Inc.; Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
    c. Sherwin-Williams Company (The); Pro Industrial Pro-Cryl® Universal Primer; B66 Series at 1.9-3.8 mils DFT.

2. Second and Third Coats:

    a. Benjamin Moore & Co.; Ultra Spec HP DTM Acrylic Low Luster HP29 or Semi-Gloss HP29.
    b. PPG Paints; Speedhide Exterior Acrylic Latex Satin 6-2045XI or Semi-Gloss 6-900XI.
    c. Sherwin-Williams Company (The); Pro Industrial™ Waterbased Alkyd Urethane Enamel Low-Gloss or Semi-Gloss; B53 Series at 1.4-1.7 DFT

E. Aluminum Substrates (Where Indicated):

1. First Coat:

    a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
    b. PPG Paints; Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
    c. Sherwin-Williams Company (The); Pro Industrial Pro-Cryl® Universal Primer; B66 Series at 1.9-3.8 mils DFT.

2. Second and Third Coats:

    a. Benjamin Moore & Co.; Ultra Spec HP DTM Acrylic Gloss Enamel HP28 or Semi-Gloss HP29.
    b. PPG Paints; Pitt-Tech Industrial DTM Acrylic Gloss 90-374.
    c. Sherwin-Williams Company (The); Pro Industrial™ Waterbased Alkyd Urethane Enamel Low-Gloss or Semi-Gloss; B53 Series at 1.4-1.7 DFT

F. Wood Substrates (Bleeding Woods and Knots):

1. First Coat:

a. Benjamin Moore & Co.; Frest Start Alkyd Exterior Primer C085.
b. PPG Paints; Seal Grip Alkyd Universal Primer 17-941NF.
c. Sherwin-Williams Company (The); Exterior Latex Waterbased Wood Primer (B42W08041)

2. Second and Third Coats:

a. Benjamin Moore & Co.; N448 Ultra Spec Exterior Satin Acrylic or Gloss N449.
b. PPG Paints: Speedhide Exterior Acrylic Satin 6-2045XI or Semi-Gloss 6-900XI.
c. Sherwin-Williams Company (The); Latitude Exterior Acrylic latex - Gloss.

G. Wood and Plywood Substrates (Non-Bleeding Woods):

1. First Coat:

a. Benjamin Moore & Co.; Fresh Start High Hiding Primer 046.
b. PPG Paints: Speedhide Exterior Latex Wood Primer 6-609.
c. Sherwin-Williams Company (The); Exterior Latex Wood Primer (B42W8041).

2. Second and Third Coats:

a. Benjamin Moore & Co.; Ultra Spec Exterior Satin, N448 or Gloss N449.
b. PPG Paints: Speedhide Exterior Acrylic Latex Satin 6-2045XI or Semi-Gloss 6-900XI.
c. Sherwin-Williams Company (The) Latitude Exterior Acrylic Latex- Gloss.

H. Fiber Cement Siding:

1. First Coat:

a. Benjamin Moore & Co.; Ultra Spec Masonry 608.
b. PPG Paints: Perma-Crete 4-808 Exterior Clear Masonry Sealer.
c. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer, (LX02W0050).

2. Second and Third Coats:

a. Benjamin Moore & Co.; N449 Ultra Spec Exterior Gloss.
b. PPG Paints: Speedhide Exterior Acrylic Latex Semi-Gloss 6-900.
c. Sherwin-Williams Company (The); SuperPaint® Exterior Latex; A80 Series at 1.5 mils DFT.

I. Portland Cement (Stucco) Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Ultra Spec Masonry High Build Masonry Primer 609.
b. PPG Paints: Perma-Crete High Build Acrylic Primer 4-2.
c. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer LX02W0050.

2. Second and Third Coats:

a. Benjamin Moore & Co.; N447 Ultra Spec Exterior Flat Acrylic.
b. PPG Paints: Speedhide Exterior 100% Acrylic Flat 6-650XI.
c. Sherwin-Williams Company (The); Loxon® XP Waterproofing Masonry Coating Flat; LX11-50 Series at 6.5-8.4 mils DFT

J. Exposed Metal Trim at Portland Cement (Stucco) Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
b. PPG Paints: Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Primer Finish B66W1.

2. Second and Third Coats:

a. Benjamin Moore & Co.; Ultra Spec DTM Acrylic Gloss Enamel HP28.
b. PPG Paints: Pitt-Tech Industrial DTM Acrylic Gloss 90-374.
c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic.

K. Exposed PVC Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Insl-X Stix Waterborne Bonding Primer SXA-110.
b. PPG Paints: Pitt-tech Int./Ext. Primer DTM Industrial Enamel 90-712.
c. Sherwin-Williams Company (The); Extreme Bond Primer B51W00150.

2. Second and Third Coats:

a. Benjamin Moore & Co.; Ultra Spec Ext, Gloss N449.
b. PPG Paints: Pitt-Tech Plus Int./Ext. Semi-Gloss DTM Industrial Enamel 90-1210.
c. Sherwin-Williams Company (The): Pro Industrial™ Waterbased Alkyd Urethane Enamel Low-Gloss or Semi-Gloss; B53 Series at 1.4-1.7 DFT

L. EFIS:

1. First Coat:

a. Benjamin Moore & Co.; N609 Ultra Spec Masonry Interior/Exterior Acrylic High Build Masonry Primer.
b. PPG Paints: Perma-Crete LTC Concrete Block and Masonry Surfacer/Filler
c. Sherwin-Williams Company (The); Loxon Concrete Masonry Primer.

2. Second and Third Coats: (Flat or Satin finish to be determined by owner)

a. Benjamin Moore & Co.; Ultra Spec Exterior Flat N447 or Satin N448
b. PPG Paints: Speedhide Exterior 100% Acrylic Latex Flat or Satin
c. Sherwin-Williams Company (The); Loxon® Self-Cleaning Acrylic Coating-Flat; LX13-50 Series at 2.0-2.9 DFT

M. Exposed Brick:

1. First Coat:

a. Benjamin Moore & Co.; Ultra Spec Masonry Int/Ext 100% Acrylic Sealer 608
b. PPG Paints.; Perma-Crete Interior/Exterior Acrylic Alkali Resistant Primer 4-603XI
c. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer/Sealer Exterior Latex LX02W0050.

2. Second and Third Coats: (Satin)

a. Benjamin Moore & Co.; Regal Select Exterior High Build Low Lustre Finish N401
b. PPG Paints.; Perma Crete Interior/exterior 100% Acrylic Hi Build 4-422XI.
c. Sherwin-Williams Company (The); Loxon® Self-Cleaning Acrylic Coating-Flat; LX13-50 Series at 2.0-2.9 DFT

3.7 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. First Coat:

a. Benjamin Moore & Co.; Ultra Spec N609 Int/Ext High Build Masonry Primer.
b. PPG Paints: Perma-Crete Alkali-Resistant Primer 4-603.
c. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer (LX02W0050.)

2. Second and Third Coats (Semi-Gloss):

    a. Benjamin Moore & Co.; T546 Ultra Spec 500 Interior Semi-Gloss.
    b. PPG Paints: Speedhide Interior Semi-Gloss Latex 6-500.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex S/G B31 Series.

B. Concrete Substrates, Vertical Surfaces (Deep Tone Accent Colors):

1. First Coat: Use tinted primer.

    a. Benjamin Moore & Co.; Ultra Spec N609 Int/Ext High Build Masonry Primer.
    b. PPG Paints: Perma-Crete Alkali-Resistant Primer 4-603.
    c. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer (LX02W0050.)

2. Second and Third Coats (Semi-Gloss): Additional coats may be required.

    a. Benjamin Moore & Co.; Ultra Spec 500 Interior Semi-Gloss T546.
    b. PPG Paints: Speedhide Interior Semi-Gloss Latex 6-500.
    c. Sherwin-Williams Company (The); ProMar 200 Zero VOC S/G B31-2600.

C. CMU Substrates:

1. First Coat:

    a. Benjamin Moore & Co.; Super Spec Masonry Int-Ext Hi-Build Block Filler 571.
    b. PPG Paints: Speedhide Interior/Exterior Latex Block Filler 6-7.
    c. Sherwin-Williams Company (The); PrepRite Block Filler B25W25

2. Second and Third Coats (Semi-Gloss):

    a. Benjamin Moore & Co.; N539 Ultra Spec 500 Interior Semi-Gloss.
    b. PPG Paints: Speedhide Interior Semi-Gloss Latex 6-500.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex S/G B31 Series.

D. CMU Substrates (Deep Tone Accent Colors):

1. First Coat: Use tinted primer.

    a. Benjamin Moore & Co.; Super Spec Masonry Int-Ext Hi-Build Block Filler 571.
    b. PPG Paints: Speedhide Interior/Exterior Latex Block Filler 6-7.
    c. Sherwin-Williams Company (The); PrepRite Block Filler B25W25.

2. Second and Third Coats (Semi-Gloss): Additional coats may be required.

    a. Benjamin Moore & Co.; Ultra Spec 500 Interior Semi-Gloss T546.
    b. PPG Paints: Speedhide Interior Semi-Gloss Latex 6-500.
    c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Coating S/G (B66-20 DTM Acrylic Coating S/G (B66-W01151 Series) or Gloss (B66-W01051 Series).

E. Steel Substrates (Deep Tone Accent Colors):

1. First Coat: Use tinted primer.

    a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
    b. PPG Paints: Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
    c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Primer Finish B66W1.

2. Second and Third Coats (Semi-Gloss): Additional coats may be required.

    a. Benjamin Moore & Co.; Ultra Spec HP DTM Acrylic Semi-Gloss HP29 or Gloss HP28.

    b. PPG Paints: Pitt-Tech Industrial DTM Acrylic Satin 90-474.

    c. Sherwin-Williams Company (The); Sherwin-Williams Company (The); Pro Industrial™ Waterbased Alkyd Urethane Enamel Low-Gloss or Semi-Gloss; B53 Series at 1.4-1.7 DFT

F. Previously Painted Steel Cabinet Heaters/ Fin tube Enclosures- up to 250 degrees:

1. First Coat:

    a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP06.
    b. PPG Paints; PPG Paints: Pitt Tech DTM Acrylic Metal Primer 90-712
    c. Sherwin-Williams Company (The); Pro Industrial Pro-Cryl® Universal Primer; B66 Series at 1.9-3.8 mils DFT.

2. Second and Third Coats (Semi-Gloss):

    a. Benjamin Moore & Co.; Super Spec HP Urethane Alkyd Gloss CP22.
    b. PPG Paints; PPG Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216
    c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Coating S/G (B66-W01151/B66-W01051).

G. Steel Piping, Piping Supports and Hangers:

1. First Coat:

a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
b. PPG Paints: Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
c. Sherwin-Williams Company (The); Pro Industrial Pro-Cryl® Universal Primer; B66 Series at 1.9-3.8 mils DFT.

2. Second and Third Coats (Semi-Gloss):

a. Benjamin Moore & Co.; T546 Ultra Spec Interior Semi-Gloss.
b. PPG Paints: Speedhide Interior Latex Semi-Gloss 6-500.
c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Coating S/G (B66-W01151/B66-W01051).

H. Galvanized-Metal Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
b. PPG Paints: Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
c. Sherwin-Williams Company (The); Sherwin Williams Pro Industrial Pro Cryl Universal Primer B66-1310

2. Second and Third Coats:

a. Benjamin Moore & Co.; Ultra Spec HP DTM Acrylic Semi-Gloss HP29.
b. PPG Paints: Pitt-Tech Industrial DTM Acrylic Satin 90-474.
c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Coating S/G (B6 6-W01151/B66-W01051).

I. Galvanized-Metal Substrates (Metal Deck):

1. First Coat:

a. Benjamin Moore & Co.; Benjamin Moore Dry Fall Latex Flat 395 or Semi-Gloss 397.
b. PPG Paints: Speed Super Tech Latex Dry Fog Spray Paint 6-724XI.
c. Sherwin-Williams Company (The); Pro Industrial Waterborne Acrylic Dry Fall Eggshell B42W200082.

2. Second and Third Coats:

a. Benjamin Moore & Co.; Benjamin Moore Dry Fall Latex Semi-Gloss 397.
b. PPG Paints: Speed Super Tech Latex Dry Fog Spray Paint 6-724XI.
c. Sherwin-Williams Company (The); Pro Industrial Waterborne Acrylic Dry Fall Eggshell B42W0082.

J. Galvanized-Metal Substrates (Metal Deck, Deep Tone Accent Colors):

1. First Coat: Use tinted primer.

    a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
    b. PPG Paints: Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
    c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Primer Finish B66 Series.

2. Second and Third Coats (Semi-Gloss):

    a. Benjamin Moore & Co.; Ultra Spec HP DTM Acrylic Semi-Gloss HP29 or Gloss HP28.
    b. PPG Paints: Pitt-Tech Interior /Exterior Satin DTM Industrial Enamel 90-474.
    c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Coating S/G or Gloss B66 Series.

K. Aluminum Substrates (Where indicated):

1. First Coat:

    a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
    b. PPG Paints: Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
    c. Sherwin-Williams Company (The); Pro Industrial Pro-Cryl® Universal Primer; B66 Series at 1.9-3.8 mils DFT.

2. Second and Third Coats (Eggshell):

    a. Benjamin Moore & Co.; Ultra Spec 500 Interior Eggshell T538.
    b. PPG Paints: Speedhide Interior Latex Eggshell 6-411.
    c. Sherwin-Williams Company (The); Pro Industrial DTM B66 Series.

L. Wood Substrates:

1. First Coat:

    a. Benjamin Moore & Co.; Fresh Start High Hiding Primer 046.
    b. PPG Paints: Seal Grip Latex Primer/Finish 17-951.
    c. Sherwin-Williams Company (The); Premium Interior Wall and Wood Primer B28W8111.

2. Second and Third Coats (Semi-Gloss):

    a. Benjamin Moore & Co.; T546 Ultra Spec 500 Interior Semi-Gloss.
    b. PPG Paints: Speedhide Interior Semi-Gloss Latex 6-500.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex S/G B31 Series.

M. Wood Substrates (Deep Tone Accent Colors):

1. First Coat: Use tinted primer.

    a. Benjamin Moore & Co.; Fresh Start High Hiding Primer 046.
    b. PPG Paints: Seal Grip Latex Primer/Finish 17-951.
    c. Sherwin-Williams Company (The); Premium Interior Wall and Wood Primer B28W8111.

2. Second and Third Coats (Semi-Gloss): Additional coats may be required.

    a. Benjamin Moore & Co.; Ultra Spec 500 Interior Semi-Gloss T546.
    b. PPG Paints: Speedhide Interior Semi-Gloss Latex 6-500.
    c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Coating S/G or Gloss B66 Series.

N. Fiberglass Reinforced Polyester (FRP) Substrates:

1. First Coat: Lightly sand before primer coat.

    a. Benjamin Moore & Co.; V175 Waterborne Bonding Primer.
    b. PPG Paints: Seal Grip Acrylic Universal Primer 17-921.
    c. Sherwin-Williams Company (The); Extreme Bond Primer B51W00150

2. Second and Third Coats (Semi-Gloss):

    a. Benjamin Moore & Co.; Coratech Command CV392 Waterborne Urethane Satin.
    b. PPG Paints: Pitt Tech Plus Acrylic Semi-Gloss Enamel 90-1210.
    c. Sherwin-Williams Company (The); Pro Industrial™ Waterbased Alkyd Urethane Enamel Low-Gloss or Semi-Gloss; B53 Series at 1.4-1.7 DFT

O. Plaster Substrates:

1. First Coat:

    a. Benjamin Moore & Co.; Fresh Start High Hiding Primer 046.
    b. PPG Paints: Perma-Crete Alkali-Resistant Primer 4-603.
    c. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer (LX02W0050).

2. Second and Third Coats (Flat):

    a. Benjamin Moore & Co.; T535 Ultra Spec 500 Interior Flat.
    b. PPG Paints: Speedhide Zero Interior Latex Flat 6-4110.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex Flat B30-2600 Series.

P. Plaster Substrates (Deep Tone Accent Colors):

1. First Coat: Use tinted primer.

    a. Benjamin Moore & Co.; Ultra Spec Int/Ext 100% Acrylic Masonry Sealer 608.
    b. PPG Paints: Perma-Crete Alkali-Resistant Primer 4-603.
    c. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer LX02W0050.

2. Second and Third Coats (Flat): Additional coats may be required.

    a. Benjamin Moore & Co.; T535 Ultra Spec 500 Interior Flat.
    b. PPG Paints: Speedhide Zero Interior Latex Flat 6-4110.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex Flat (B30-2600 Series).

Q. Gypsum Board Substrates:

1. First Coat:

    a. Benjamin Moore & Co.; Fresh Start High Hiding Primer 046.
    b. PPG Paints: Speedhide Interior Latex Primer/Sealer 6-2.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex Primer (B28W02600.)

2. Second and Third Coats (Flat): Additional coats may be required.

    a. Benjamin Moore & Co.; T535 Ultra Spec 500 Interior Flat.
    b. PPG Paints: Speedhide Zero Interior Latex Flat 6-4110.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex Flat B30-2600 Series.

R. Gypsum Board Substrates (Deep Tone Accent Colors):

1. First Coat: Use tinted primer.

    a. Benjamin Moore & Co.; Fresh Start High Hiding Primer 046.
    b. PPG Paints: Speedhide Interior Latex Primer/Sealer 6-2.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex Primer (B28W02600.)

2. Second and Third Coats (Flat): Additional coats may be required.

    a. Benjamin Moore & Co.; T535 Ultra Spec 500 Interior Flat.
    b. PPG Paints: Speedhide Zero Interior Latex Flat 6-4110.
    c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Flat B30-2600 Series.

3.8 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Stained Wood (Closed or Open Grain):

1. First Coat:

a. Benjamin Moore & Co.; Lenmar Interior Waterborne Stain.
b. PPG Paints: Olympic Interior Low VOC Oil Stain 44500.
c. Sherwin-Williams Company (The); Minwax Wood Finish 250 VOC Compliant Stain (7107 Series).

2. Second and Third Coats (Eggshell/Low Lustre):

a. Benjamin Moore & Co.; Stay Clear Low-Lustre Acrylic Polyurethane W423.
b. PPG Paints: Olympic Interior Satin Polyurethane 43886.
c. Sherwin-Williams Company (The); Minwax High Build Polyurethane Satin (009919945)

B. Stained Wood (Closed or Open Grain): Apply wood grain filler to open grain wood.

1. First Coat:

a. Benjamin Moore & Co.; Lenmar Interior Waterborne Stain.
b. PPG Paints: Olympic Interior Low VOC Oil Stain 44500.
c. Sherwin-Williams Company (The); Minwax Wood Finish 250 VOC Compliant Stain (7107 Series)

2. Second and Third Coats (Semi-Gloss/High Gloss):

a. Benjamin Moore & Co.; Stays Clear Acrylic Polyurethane W422.
b. PPG Paints: Olympic Interior Semi-Gloss Satin Polyurethane 43886.
c. Sherwin-Williams Company (The); Minwax High Build Polyurethane Semi-Gloss (009919937) or Gloss (009919929)

END OF SECTION 09 91 00

SECTION 09 96 00 – HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and application of high-performance coating systems, for the following:

1. Exterior applications.

2. General use interior applications.

a. Painting systems indicated on Drawings and in Schedules applied to new and existing exterior and interior surfaces and related components including but not limited to items such as hollow metal doors frames, doors, access doors, trim pieces, window sash, trim and previously painted cabinet heater/fin tube enclosures, etc., unless otherwise indicated, including appropriate surface preparation for all new or existing surfaces to be painted including previously painted surfaces and surfaces with existing wall coverings

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product for substrates indicated. Include preparation requirements and application instructions. Include all paint products under one cover sheet.

1. Exterior steel.
2. Exterior Steel – Gas Piping
3. Exterior galvanized metal.
4. Exterior wood.
5. Exterior aluminum.
6. Exterior urethane.
7. Exterior CMU.
8. Exterior Cement Board.
9. Interior concrete, vertical surfaces.
10. Interior concrete floors in janitor closets.
11. Interior concrete floors in kitchen storage rooms.

12. Interior concrete floors in mechanical rooms.
13. Interior concrete floors in stage and auditorium.
14. Interior concrete floors in locker rooms (slip-resistant).
15. Interior CMU, smooth finish.
16. Interior CMU, rough industrial finish.
17. Interior steel, galvanized-metal, and non-ferrous metal.
18. Interior wood with previously applied coatings.
19. Interior gypsum board and plaster (non-wet environments).

B. Samples for Verification and Initial Selection: For each type of coating system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of paint to include in maintenance manuals.

B. Warranty: Each product warranty.

C. Coatings Maintenance Manual:

1. Upon conclusion of the project, the contractor or paint manufacture/supplier shall furnish a coatings maintenance manual such as Sherwin Williams “Custodian Project Color and Product Information” report. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions. Touch up procedures and color samples of each color and finish used. All information contained in a self-bound 3 ring hole punched catalog.

1.6 QUALITY ASSURANCE

A. Qualification Data: For applicator.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 10 percent, but not less than 1 gal. of each material and color applied.

1.8 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual, experienced in applying high performance coatings specified in this Section, who has successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; familiar with special requirements indicated; and with sufficient trained staff to apply manufacturer's products according to specified requirements.

B. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.10 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Do not apply exterior coatings in snow, rain, fog, or mist.
D. Lighting: Do not install high-performance coatings until a lighting level of not less than 80 fc is provided on the surfaces to receive coating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. Benjamin Moore & Co.
2. Sherwin-Williams Company (The).
3. Tnemec Inc.

B. Submittals containing manufactures other than stated above, will require a product by product comparison for each type of paint. All Comparable equals are to be matched with corresponding Sherwin Williams's specified products.

C. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to products listed in Part 3 articles for the application indicated.

2.2 HIGH PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.

3. Provide products of same manufacturer for each coat in a coating system.

4. "All-in-one" paint and primer products are not acceptable.

B. VOC Compliance: Provide exterior coating products complying with New York requirements for Volatile Organic Compound (VOC) and Ozone Transport Commission (OTC) regulations, January 2005.

C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

a. Concrete: 12 percent.
b. Masonry (Clay and CMU): 12 percent.
c. Wood: 15 percent.
d. Gypsum Board: 12 percent.
e. Plaster: 8 percent.

B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Plaster Substrates: Verify that plaster is fully cured.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

C. Concrete Substrates: 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.

D. Concrete Floors: Prepare by diamond grinding, whip blasting, or mechanical shot blasting, as recommended by coating manufacturer.

E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal using bio-degradable detergent. Then abrasive blast with fine abrasive to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

I. Aluminum Substrates: Remove loose surface oxidation by scarification.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer apply coat of knot sealer recommended in writing by topcoat manufacturer for coating system indicated.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime edges, ends, faces, undersides, and back sides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Galvanized Metal/Galvanized Deck- Factory Primed Surface: Coordinate with approved paint manufacturer on compatibility of paint finish coats to factory prime surface.

L. After removing all surface contamination, the surface should be scuff sanded or scrubbed with an abrasive cleaner to dull the surface for best adhesion.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.

2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.

2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:

1. First Coat:

a. Benjamin Moore & Co.; (No Zinc primers) suggest Corotech V160 Epoxy Mastic Coating @4.6-7.2 DFT.
b. Sherwin-Williams Company (The); Corothane 1 Gal-Va-Pac Zinc Primer B65G00010 at 3.0-4.0 mils DFT.
c. Tnemec Inc.; Series 90-97 Tneme-Zinc at 2.5 to 3.5 mils DFT.

2. Second Coat:

    a. Benjamin Moore & Co. ;Corotech V160 Epoxy Mastic Coating @4.6-7.2 DFT
    b. Sherwin-Williams Company (The); Macropoxy 646 B58 series 7.0-5.0 mils DFT
    c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

3. Third Coat:

    a. Benjamin Moore & Co.; Corotech V500 Acrylic Aliphatic Urethane Coating Gloss or V510 Acrylic Aliphatic Urethane Coating Semi-Gloss at 3.2-4.6 mils DFT
    b. Sherwin-Williams Company (The); Hi Solids Polyurethane B65 series 4.5-3.0 mils DFT
    c. Tnemec Inc.; Series 1074 or 1095 Endura-Shield II at 2.0 to 5.0 mils DFT.

B. Galvanized-Metal Substrates:

1. First Coat:

    a. Benjamin Moore & Co.; Corotech V160 Epoxy Mastic Coating @4.6-7.2 DFT
    b. Sherwin-Williams Company (The); Macropoxy 646 B58 series 7.0-5.0 mils DFT
    c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

2. Second Coat:

    a. Benjamin Moore & Co.; Corotech V500 Acrylic Aliphatic Urethane Coating Gloss or V510 Acrylic Aliphatic Urethane Coating Semi-Gloss at 3.2-4.6 DFT
    b. Sherwin-Williams Company (The); Hi Solids Polyurethane B65 series 4.5-3.0 mils DFT
    c. Tnemec Inc.; Series 1074 or 1095 Endura-Shield II at 2.0 to 5.0 mils DFT.

C. Wood Substrates:

1. First Coat:

    a. Benjamin Moore & Co.; Insul-X Aqua Lock Plus Primer
    b. Sherwin-Williams Company (The); Exterior Oil-Based Wood Primer Y24W8020 at 2.3 mils DFT
    c. Tnemec Inc.; Series V10-99W Primer

2. Second and Third Coat:

    a. Benjamin Moore & Co.; Corotech V331 Acrylic DTM Enamel Semi-Gloss at 2-2.2 DFT (third coat of same)
    b. Sherwin-Williams Company (The); Sher-Cryl HPA High Performance Acrylic Semi-Gloss B66W350 at 2.5-4.0 mils DFT.
    c. Tnemec Inc.; Series 1029 Enduratone

D. Aluminum Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Corotech V160 Epoxy Mastic Coating @4.6-7.2 DFT
b. Sherwin-Williams Company (The); Macropoxy 646 Fast Cure Epoxy B58W610 at 5.0-10.0 mils DFT
c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 4.0-6.0 mils DFT

2. Second Coat:

a. Benjamin Moore & Co. ;Corotech V500 Acrylic Aliphatic Urethane Coating Gloss or V510 Acrylic Aliphatic Urethane Coating Semi-Gloss at 3.2-4.6 DFT
b. Sherwin-Williams Company (The); Hi Solids Polyurethane B65 series 4.5-3.0 mils DFT
c. Tnemec Inc.; Series 1074 or 1095 Endura-Shield II at 2.0-5.0 mils DFT

E. Urethane Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Insl-X Stix XSA 110 Bonding Primer
b. Sherwin-Williams Company (The); Multi-Purpose Interior/Exterior Latex Primer/Sealer B51-450 Series at 1.4 mils DFT.
c. Tnemec Inc.; Series 151-1051 Elasto-Grip F.C. at 1.0 to 2.0 mils DFT.

2. Second and Third Coat:

a. Benjamin Moore & Co.; Corotech V331 Acrylic DTM Enamel Semi-Gloss at 2-2.2 DFT (third coat of same)
b. Sherwin-Williams Company (The); Sher-Cryl HPA High Performance Acrylic Semi-Gloss B66W350 at 2.5-4.0 mils DFT.
c. Tnemec Inc.; Series 1029 Enduratone.

F. CMU:

1. First Coat:

a. Benjamin Moore & Co. ;Ultra-Spec Masonry 100% Acrylic Masonry 608 Flat @9. DFT
b. Sherwin-Williams Company (The); Con-Flex XL High Build Coating A05W451 at 6.0-7.5 mils DFT.
c. Tnemec Inc.; Series 156 Color Enviro-Crete @4.0-8.0 mils DFT (use Tnemec-Tape for cracks larger than 1/64” wide)

2. Second Coat:

    a. Benjamin Moore & Co.; Super Spec Masonry 100% Acrylic Elastomeric 360.
    b. Sherwin-Williams Company (The); Con-Flex XL High Build Coating A05W451 at 6.0-7.5 mils DFT.
    c. Tnemec Inc.; Series 156 Color Enviro-Crete @4.0-8.0 mils DFT

G. Cement Siding:

1. First Coat:

    a. Benjamin Moore & Co.; Ultra-Spec Int/Ext Acrylic Masonry 609 -Series, (1.0-4.3) DFT.
    b. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer, LX 02W0050, (2.1-3.2 mils) DFT.
    c. Tnemec Inc.; Series 27WB Low VOC Water Base Epoxy (6.0 – 12.0 mils) DFT.

2. Second Coat:

    a. Benjamin Moore & Co.; Element Guard 763/764/765 Series, (1.4 mils) DFT.
    b. Sherwin-Williams Company (The); Resilience Acrylic Exterior, K43 Series, (1.6 mils) DFT.
    c. Tnemec Inc.; Series 1029 HDP Acrylic Water Based Polymer, (2.5 mils) DFT

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE: GENERAL USE

A. Concrete Substrates, Vertical Surfaces:

1. First Coat:

    a. Benjamin Moore & Co.; Ultra-Spec Masonry Interior/Exterior Acrylic High Build Primer, 609 1.0 DFT.
    b. Sherwin-Williams Company (The); Loxon Concrete and Masonry Primer A24W8300 at 3.2-2.1 mils DFT.
    c. Tnemec Inc.; Series 1029 Enduratone at 2.5 to 3.0 mils DFT.

2. Second and Third Coats:

    a. Benjamin Moore & Co.; Corotech V331 Acrylic DTM Enamel Semi-Gloss at 2-2.2 DFT (third coat of same)
    b. Sherwin-Williams Company (The); Sher-Cryl HPA High Performance Acrylic Semi-Gloss B66W350 at 2.5-5.0 mils DFT.
    c. Tnemec Inc.; Series 1029 Enduratone at 2.5 to 3.0 mils DFT each.

B. Concrete Floors in Janitor Closets:

1. First Coat:

a. Benjamin Moore & Co.; Corotech V155 100% Solid Epoxy Primer @1.0-1.5 DFT
b. Sherwin-Williams Company (The); Macropoxy 646-100 Fast Cure Epoxy B58-620 Series at 5.0-10.0 mils DFT.
c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

2. Second Coat:

a. Benjamin Moore & Co.; Corotech V400 fast Dry Polyamide Epoxy @3.6-4.0 DFT
b. Sherwin-Williams Company (The); Macropoxy 646-100 Fast Cure Epoxy B58-620 Series at 5.0-10.0 mils DFT.
c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

C. Concrete Floors in Kitchen Storage Rooms:

1. First Coat:

a. Benjamin Moore & Co.; Corotech V155 100% Solid Epoxy Primer @1.0-1.5 DFT
b. Sherwin-Williams Company (The); ArmorSeal 33 Epoxy Primer/Sealer B58AQ33/B60VQ33 at 8.0 mils DFT.
c. Tnemec Inc.; Series 201 Epoxoprime at 6.0 to 8.0 mils DFT.

2. Second Coat:

a. Benjamin Moore & Co.; Corotech V 400/V400-92 Polyamide Epoxy Coating at 2-2.5 DFT.
b. Sherwin-Williams Company (The); Hi-Solids Polyurethane; B65 Series at 3.0-5.0 mils DFT.
c. Tnemec Inc.; Series 280 Tneme-Glaze at 6.0 to 8.0 mils DFT.

3. Third Coat:

a. Benjamin Moore & Co.; Corotech V 400/V400-92 Polyamide Epoxy Coating at 2-2.5 DFT
b. Sherwin-Williams Company (The); ArmorSeal Rexthane, B65 series 3.0-2.0 mils DFT
c. Sherwin-Williams Company (The); Hi-Solids Polyurethane; B65 Series at 3.0-5.0 mils DFT.

D. Concrete Floors in Mechanical Rooms:

1. First Coat:

a. Benjamin Moore & Co. ;;Corotech V155 100% Solid Epoxy Primer @1.0-1.5 DFT
b. Sherwin-Williams Company (The); Macropoxy 646-100 Fast Cure Epoxy B58-620 Series at 5.0-10.0 mils DFT.
c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

2. Second Coat:

    a. Benjamin Moore & Co.;Corotech V400 Fast Dry Polyamide Epoxy @3.0-4.0 DFT
    b. Sherwin-Williams Company (The); Macropoxy 646-100 Fast Cure Epoxy B58-620 Series at 5.0-10.0 mils DFT.
    c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

3. Third Coat:

    a. Benjamin Moore & Co.; Corotech V400 Fast Dry Polyamide Epoxy @3.0-4.0 DFT
    b. Sherwin-Williams Company (The); Macropoxy 646-100 Fast Cure Epoxy B58-620 Series at 5.0-10.0 mils DFT.
    c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

E. Concrete Floors in Stage and Auditorium:

1. First Coat:

    a. Benjamin Moore & Co.;Corotech V155 100% Solid Epoxy Primer @1.0-1.5 DFT
    b. Sherwin-Williams Company (The); ArmorSeal 33 Epoxy Primer/Sealer B58AQ33/B60VQ33 at 8.0 mils DFT.
    c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

2. Second Coat:

    a. Benjamin Moore & Co.; Corotech V430 100% Solid Floor Coating @1.0-1.5 DFT
    b. Sherwin-Williams Company (The); ArmorSeal HS Polyurethane Floor Enamel B65 series 3.0-2.0 mils DFT
    c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.

F. Concrete Floors in Locker Rooms (Slip-Resistant):

1. First Coat: Silica sand #33 broadcast over first coat while still wet prior to application of first and second coat while still wet, per manufacturer's instructions.

    a. Benjamin Moore & Co.; Corotech V155 100% Solid Epoxy Mastic Coating @1.0-1.5 DFT
    b. Sherwin-Williams Company (The); ArmorSeal 33 Epoxy Primer/Sealer B58AQ3-B60VQ33 at 8.0 mils DFT.
    c. Tnemec Inc.; Series 201 Epoxoprime at 6.0 to 8.0 mils DFT.

2. Second Coat:

    a. Benjamin Moore & Co.; Corotech V 400/V400-92 Polyamide Epoxy Coating at 2-2.5 DFT
    b. Sherwin-Williams Company (The); Hi-Solids Polyurethane; B65 Series at 3.0-5.0 mils DFT.
    c. Tnemec Inc.; Series 280 Tneme-Glaze at 6.0 to 8.0 mils DFT.

3. Third Coat:

    a. Benjamin Moore & Co. ;Corotech V 400/V400-92 Polyamide Epoxy Coating at 2-2.5 DFT
    b. Sherwin-Williams Company (The); ArmorSeal Rexthane, B65 series 3.0-2.0 mils DFT
    c. Sherwin-Williams Company (The); Hi-Solids Polyurethane; B65 Series at 3.0-5.0 mils DFT.

G. CMU Substrates, Smooth Finish:

1. First Coat: Apply at 60 to 80 sq. ft. per gallon.

    a. Benjamin Moore & Co. ;Ultra Spec Hi-Build Filler at 8.5-11.3 DFT
    b. Sherwin-Williams Company (The); Pro Industrial Heavy Duty Block Filler B42W00150 at 8.0-10.5 mils DFT.
    c. Tnemec Inc.; Series 130-6602 Envirofill.

2. Second Coat:

    a. Benjamin Moore & Co.; Corotech V330 Acrylic DTM Enamel Gloss
    b. Sherwin-Williams Company (The); Pro Industrial Multi-Surface Acrylic Gloss B66W501 at 1.5-2.0 mils DFT
    c. Tnemec Inc.; Series 1028 Enduratone at 2.5 to 3.0 mils DFT.

3. Third Coat:

    a. Benjamin Moore & Co. ;Corotech V330 Acrylic DTM Enamel Gloss
    b. Sherwin-Williams Company (The); Pro Industrial Multi-Surface Acrylic Gloss B66W501 at 1.5-2.0 mils DFT
    c. Tnemec Inc.; Series 1028 Enduratone at 2.5 to 3.0 mils DFT.

H. CMU Substrates, Rough Industrial Finish:

1. First Coat: Apply at 60 to 80 sq. ft. per gallon.

    a. Benjamin Moore & Co. ;Ultra Spec Hi-Build Filler at 8.5-11.3 DFT
    b. Sherwin-Williams Company (The); Pro Industrial Heavy Duty Block Filler B42W00150 at 8.0-10.5 mils DFT.
    c. Tnemec Inc.; Series 130-6602 Envirofill.

2. Second Coat:

    a. Benjamin Moore & Co. ;Corotech V331 Acrylic DTM Enamel at 1.9-2.1 DFT
    b. Sherwin-Williams Company (The); Sher-Cryl HPA High Performance Acrylic Semi-Gloss B66-W350 at 2.5-5.0 mils DFT.
    c. Tnemec Inc.; Series 1029 Enduratone at 2.5 to 3.0 mils DFT.

3. Third Coat:

    a. Benjamin Moore & Co. ;Corotech V331 Acrylic DTM Enamel at 1.9-2.1 DFT
    b. Sherwin-Williams Company (The); Sher-Cryl HPA High Performance Acrylic Semi-Gloss B66-W350 at 2.5-5.0 mils DFT.
    c. Tnemec Inc.; Series 1029 Enduratone at 2.5 to 3.0 mils DFT.

I. Galvanized-Metal, and Non-Ferrous Metal Substrates:

1. First Coat: 2.0 to 3.0 mils DFT.

    a. Benjamin Moore & Co. ;Corotech V160-1 Epoxy Mastic Coating @4.6-7.2 DFT
    b. Sherwin-Williams Company (The); Macropoxy 646 B58 series 7.0-5.0 mils DFT
    c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline.

2. Second and Third Coats: 2.0 to 3.0 mils DFT each.

    a. Benjamin Moore & Co. ;Corotech V500 Acrylic Aliphatic Urethane Coating Gloss
    b. Sherwin-Williams Company (The); Macropoxy 646 B58 series 7.0-5.0 mils DFT
    c. Tnemec Inc.; Series 66HS Hi-Build Epoxoline.

3. Third Coats: 2.0 to 3.0 mils DFT each.

    a. Benjamin Moore & Co.; Corotech V500 Acrylic Aliphatic Urethane Coating Gloss
    b. Sherwin-Williams Company (The); Not Required.
    c. Tnemec Inc.; Series 1081 Endura-Shield.

J. Steel, Structural Steel:

1. First Coat: 2.0 to 3.0 mils DFT.

    a. Benjamin Moore & Co.; Corotech V160-1 Epoxy Mastic Coating @4.6-7.2 DFT
    b. Sherwin-Williams Company (The); High Solids Alkyd Metal Primer B50WZ0003 series 3.0-5.0 mils DFT
    c. Tnemec Inc.; Series V10.

2. Second and Third Coats: 2.0 to 3.0 mils DFT each.

    a. Benjamin Moore & Co. ;Corotech V500 Acrylic Aliphatic Urethane Coating Gloss
    b. Sherwin-Williams Company (The); Pro Industrial Acrolon 100 B65 Series, 4.0-1.8 mils DFT
    c. Tnemec Inc.; Series V10.

3. Third Coats: 2.0 to 3.0 mils DFT each.

    a. Benjamin Moore & Co.; Corotech V500 Acrylic Aliphatic Urethane Coating Gloss
    b. Sherwin-Williams Company (The); Pro Industrial Acrolon 100 B65 Series, 4.0-1.8 mils DFT
    c. Tnemec Inc.; Series 1081 Endura-Shield.

K. Wood Substrates with Previously Applied Coatings:

1. First Coat:

   a. Benjamin Moore & Co. ;Ultra Spec 500 Latex Primer Sealer, N534 @1.8 DFT
   b. Sherwin-Williams Company (The); Sher-Cryl HPA High Performance Acrylic Semi-Gloss B66W350 at 2.5-5.0 mils DFT.
   c. Tnemec Inc.; Series 1029 Enduratone at 300 sq. ft. per gallon.

2. Second Coat:

   a. Benjamin Moore & Co. ;Corotech V331 Acrylic DTM Enamel at 1.9-2.1 DFT
   b. Sherwin-Williams Company (The); Sher-Cryl HPA High Performance Acrylic Semi-Gloss B66W350 at 2.5-5.0 mils DFT.
   c. Tnemec Inc.; Series 1029 Enduratone at 300 sq. ft. per gallon.

L. Gypsum Board and Plaster Substrates (Non-Wet Environments):

1. First Coat: 1.0 to 2.0 mils DFT.

   a. Benjamin Moore & Co. ;Ultra Spec 500 Latex Primer Sealer N534 @ 1.4 DFT.
   b. Sherwin-Williams Company (The); ProMar 200 Zero VOC Interior Latex Primer B28W2600 at 1.0 mils DFT.
   c. Tnemec Inc.; Series 51 PVA Sealer

2. Second and Third Coat:

   a. Benjamin Moore & Co.; Corotech V331 Acrylic DTM Enamel at 1.9-2.1DFT
   b. Sherwin-Williams Company (The); Sher-Cryl HPA High Performance Acrylic Semi-Gloss B66W350 at 2.5-5.0 mils DFT.
   c. Tnemec Inc.; Series 1029 Enduratone at 2.5 to 3.0 mils DFT.

M. Glazed Block - Smooth Finish

1. First Coat:

   a. Benjamin Moore & Co.; Insul –X Aqua-Lock Sealer
   b. Sherwin Williams Company: Multi-Purpose Interior/Exterior Primer/Sealer B51-450 Series at mils DFT.
   c. Tnemec: Series 66HS Color Hi-Build Epoxoline @ 2.0-3.0 mils DFT

2. Second Coat:

   a. Benjamin Moore & Co. ; Corotech 341 Pre-Catalyzed Epoxy @1.7-2.0 DFT
   b. Sherwin-Williams Company: Pro Industrial High-Performance Epoxy B67 Series at 4.0-8.0 mils DFT.
   c. Tnemec: Series 66HS Color Hi-Build Epoxoline @ 2.0-3.0 mils DFT.

END OF SECTION 09 96 00

SECTION 10 11 00 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Markerboards.
2. Tackboards.
3. Support systems for visual display boards.

1.3 DEFINITIONS

A. Tackboard: Framed or unframed, tackable, visual display board assembly.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

1. Porcelain-enamel markerboards.
2. Vinyl-fabric-faced tackboards.
3. Flag holder.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of panel joints.
2. Show locations of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members.

C. Samples for Verification and Initial Color Selection: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:

1. Actual sections of porcelain-enamel face sheet.
2. Fabric swatches of vinyl fabric-faced tack assemblies.
3. Include accessory Samples to verify color selected.

D. Warranties: Sample of special warranties.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For visual display surfaces to include in maintenance manuals.
B. Warranties: Executed special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of motor-operated, sliding visual display units required for this Project.

B. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
   Smoke-Developed Index: 450 or less.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weather tight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.11 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated.

1. Manufacturers: For convenience specifications and details are based on Claridge Products and Equipments, Inc. Harrison Arkansas, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. PolyVision Corporation; a Steelcase company.
   b. Best-Rite Manufacturing.

2. Matte Finish: Low reflective; chalk wipes clean with dry cloth or standard eraser.

3. Gloss Finish: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser.

B. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II; weighing not less than 20 oz./sq. yd.; with surface-burning characteristics indicated.

C. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 16 oz./sq. yd.; with surface-burning characteristics indicated.

D. Hardboard: ANSI A135.4, tempered.

E. Particleboard: ANSI A208.1, Grade M-1.

F. Fiberboard: ASTM C 208.

G. Extruded Aluminum: ASTM B 221, Alloy 6063.

H. Adhesives: Manufacturer's standard product that complies 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."

2.2 TACKBOARD ASSEMBLIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc, Similar to "Fabricork Vinyl Bulletin Boards" and or comparable product by one of the following :

1. Best-Rite Manufacturing.
2. PolyVision Corporation; a Steelcase company.

B. Vinyl-Fabric-Faced Tackboard: 1/4-inch-thick, Type II vinyl-fabric-faced cork sheet factory laminated to 1/4-inch-thick hardboard backing.

C. Polyester-Fabric-Faced Tackboard: 1/4-inch-thick, polyester-fabric-faced cork sheet factory laminated to 1/4-inch-thick hardboard backing.

D. Flammability of Vinyl and Cork Materials (ASTM E-84) - Meet or exceed following requirements:

E. Flame spread less than 25

F. Smoke developed less than 450

G. Assembly Weight: 1 lb./sq. ft.

H. Assembly Thickness: Approximately 1/2-inch.

I. TackBoard vinyl weight: min. 15 oz.

2.3 BOARD UNIT ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; of size and shape indicated on Drawings.

1. Factory-Applied Trim: Manufacturer's standard.

B. Chalktray: Manufacturer's standard, continuous.

1. Solid Type: Extruded aluminum with ribbed section with screw on chalk trough end enclosures.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc.; “No. 262 Chalk Trough”.

C. Map Rail: Provide the following accessories:

1. Integral Display Rail: Continuous and integral with map rail; fabricated from cork approximately 2 inches wide.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc.; No. 151 Head Trim Map Rail”.

2. Flag Holder: One for each room.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc.; No.76FH Flag Holders”.

2.4 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.

2. Provide manufacturer's standard vertical-joint spline, system between abutting sections of chalkboards and/or marker board.

3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.

4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.

C. Examine walls and partitions for proper preparation and backing for visual display surfaces.

D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

F. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

1. Prime wall surfaces indicated to receive direct-applied, visual display tack wall panels and as recommended in writing by primer/sealer manufacturer and wall covering manufacturer.

D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches o.c.

a. Attach chalktrays to boards with fasteners at not more than 12 inches o.c.

3.5 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
B. Touch up factory-applied finishes to restore damaged or soiled areas.
C. Cover and protect visual display surfaces after installation and cleaning.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated, sliding visual display units.

END OF SECTION 10 11 00

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior unframed signs.
2. Identification of buildings utilizing truss type construction signs.

B. Scope: Provide room identification signs at all permanent rooms. Room identification signs to contain room names, room numbers, and graphics as indicated on Drawings and in Signage Schedule attached to this Section. Provide other signs as indicated on Drawings and in Signage Schedule attached to this Section.

1. Provide barrier-free and tactile signage at all locations required by Code and as indicated on Drawings.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Signage supplier is to provide an on-site meeting with Owner/District representative to discuss all requirements for signage selection.

2. Review requirements for signage including, but not limited to, the following:

a. Size, configuration, and location of each sign.
b. Text, room name, room number, and graphics selections.
c. Color selections.
d. Sign Samples.
e. Sign quantities.

3. Review requirements for accessible signage.

4. Review requirements for mounting locations, heights, and types.

1.5 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for signs.

1. Interior unframed signs.
2. Identification of buildings utilizing truss type construction signs.
3. Wayfinding directional signs.
4. Map holder signs.
5. Courtyard signs.
6. Exterior directional signs.
7. Field-applied, vinyl-character signs.
8. Accessories.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements including raised characters and Braille and layout for each sign.
4. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), and as follows:

1. Signs: Full-size Sample of interior unframed sign.

E. Product Schedule: For signs. Use same designations indicated on Drawings or specified.

F. Sample Warranty: For special warranty.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.
B. Warranty: Executed special warranty.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to correct 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 finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", ICC A117.1, and building Code in effect for Project.

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 200 or less.
2. Smoke-Developed Index: 450 or less.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, unless otherwise indicated, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASI Sign Systems, Inc., dba ASI.
2. Best Sign Systems, Inc.
3. Mohawk Sign Systems.

B. Source Limitations: Obtain signs from single source from single manufacturer.

2.3 INTERIOR UNFRAMED SIGNS

A. Interior Unframed Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; for interior use, and as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide ASI; EmBoss ADA-Ready Sign System, or comparable product.

2. Sign Materials:

   a. Mounting Panel: 0.125-inch-thick acrylic.
   b. Face: 0.0015-inch-thick PVC/vinyl acetate bonded to mounting panel.

3. Fabrication:

   a. Graphics and Text: Accessible tactile copy and Grade 2 Braille (except as otherwise indicated). Color as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.

      1) Where "(#)" appears in Sign Type paragraph below, verify with Architect number to be used in place of "(#)".
      2) Where "(room name)" appears in Sign Type paragraph below, verify with Architect room name to be used in place of "(room name)".

   b. Typeface: As selected by Architect from manufacturer's full range.

   c. Background: Finish and color as selected by Architect from manufacturer's full range.

4. Mounting: Manufacturer's standard method for substrates indicated.

B. Sign Types:

1. Type 1: Occupancy Load Sign:

   a. Size: 3'-8" wide by 1'-2" high.

   b. Text Size, Color, and Content:

      1) 3-inch-high, 3/4-inch stroke, red lettering: MAXIMUM OCCUPANCY.
      2) 2-inch-high, 1/2-inch stroke, red lettering: NOT TO EXCEED.
      3) 3-inch-high, 3/4-inch stroke, red lettering: (#) PERSONS.

   c. Field Color: White.

   d. Provide in locations indicated and in compliance with requirements of authorities having jurisdiction.

2. Type 5: Room Name/Number Sign:

   a. Size: 6 inches by 6 inches.

   b. Text Size, Font Style, and Content:

      1) 1-inch-high (minimum) sans serif lettering: (#).
      2) 5/8-inch-high (minimum) sans serif lettering: (room name).

   c. Arrangement: Two lines where needed.

3. Type 7: Room Sign:

   a. Size: 6 inches wide by 2 inches high.
   b. Text Size and Content: 5/8-inch-high (minimum) lettering: (room name).

4. Type 10a: Restroom Sign:

   a. Size: 8 inches by 8 inches.
   b. Graphics: Gender neutral/wheelchair accessibility symbol.

2.4 IDENTIFICATION OF BUILDINGS UTLIZING TRUSS TYPE CONSTRUCTION SIGNS

A. Identification of Buildings Utilizing Truss Type Construction Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces and precisely formed lines and profiles; for interior use, complying with New York 19NYCRR Part 1264 requirements, and as follows:

   1. Basis-of-Design Product: Subject to compliance with requirements, provide Compliance Signs; Reflective New York Truss Construction Sign, or comparable product.

   2. Material: 6-mil-thick vinyl.

   3. Fabrication:

      a. Graphics: 6-inch outside diameter, 1/2-inch-thick reflective red circle.

      b. Text Size, Stroke, and Color: 2-inch-high (minimum), 1/2-inch stroke, reflective red lettering.

      c. Background: Reflective white.

      d. Content and Arrangement: Roman alphanumeric designation of construction type of building located over the alphabetic designation of structural components designation that are of truss construction.

         1) Refer to code compliance drawings for construction type.

B. Sign Types:

1. Type 11: Identification of Buildings Utilizing Truss Type Construction Sign:

a. Size: 6-inch diameter.
b. Material: Aluminum.
c. Mounting: Manufacturer's standard method for substrates indicated.

2. Type 11a: Identification of Buildings Utilizing Truss Type Construction Decal:

a. Size: 6-inch diameter.
b. Material: Vinyl.
c. Mounting: Surface mounted with adhesive. Decal to be adhesive on side as required for installation.

2.5 SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

D. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.

E. Reflective Vinyl Film: UV-resistant reflective vinyl film with pressure-sensitive, permanent adhesive.

F. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.6 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Furnish stainless-steel devices unless otherwise indicated.

2. Sign Mounting Fasteners:

a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.

B. Adhesive: As recommended by sign manufacturer.

1. Verify adhesives have a VOC content of 70 g/L or less.

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.7 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Drill and tap for required fasteners. Use exposed fasteners that match sign finish.

B. Tactile and Braille Characters: In compliance with listed accessibility standard in “Performance Requirements” Article, raised 1/32-inch minimum above background.

2.8 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.
D. Proceed with installation only after unsatisfactory conditions have been corrected.
E. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessibility: Install signs in locations as indicated on Drawings and according to the accessibility standard.

C. Mounting Locations: Locate on wall adjacent to latch side of door 60 inches from center of sign to finished floor, and 2 inches from edge of door frame. Where adequate wall space adjacent to latch side of door is not available, and at double-leaf doors, place sign on nearest adjacent wall.

1. Kindergarten Toilet Rooms: Mount sign 48 inches from center of sign to finished floor, and 2 inches from edge of door frame.

D. Mounting Methods:

1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position and push to engage tape adhesive.

E. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

F. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully corrected by finish touchup or similar minor corrective procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 00

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cutout dimensional characters.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For dimensional letter signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples for Verification and Initial Color Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.
2. Dimensional Characters: Full-size Sample of each type of dimensional character.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify locations by field measurements before fabrication, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 DIMENSIONAL CHARACTERS

A. Cutout Characters: Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide ASI Sign Systems, Inc.; LPS Series or comparable product by one of the following:

a. ACE Sign Systems, Inc.
b. Gemini Incorporated.
c. Metallic Arts.

2. Character Material: Sheet or plate aluminum.

3. Character Height: As indicated.

4. Thickness: Manufacturer's standard for size of character.

5. Finishes:

a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.

6. Mounting: Concealed studs.

7. Typeface: As indicated.

2.3 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.

2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.

3. Exposed Metal-Fastener Components, General:

   a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

4. Sign Mounting Fasteners:

   a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.

4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

5. Internally brace signs for stability and for securing fasteners.

6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.

b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 19

SECTION 10 14 53 - TRAFFIC SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Traffic signs. Related Sections:

1. Section 03 30 00 “Cast-In-Place Concrete”
2. Section 32 50 00 “Bollards”

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Traffic signs.
2. Traffic sign posts in metal bollards.

B. Shop Drawings: For traffic signage.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights and accessories.
3. Show message list, typestyles, graphic elements, colors and layout for each sign at least half size.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Comply with all applicable state and local requirements for traffic signs, including (but not limited to) reflectivity, foundation construction, and wind resistance.

1. Comply with U.S. Department of Transportation's Manual on Uniform Traffic Control Devices (MUTCD), AASHTO M268 and NYSDOT standard specifications and regulations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard:

1. Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities, ICC A117.1, and building code in effect for Project for signs.

2. Comply with applicable provisions in the New York State Department of State Division of Administrative Rules, Part 300 Universal Symbol of Access, Part 300.4 Accessible Wording, Part 300.5 Accessible Symbol, Part 300.6 Accessibility Graphic and Components, and building code in effect for Project for signs.

2.2 TRAFFIC SIGNS

A. Traffic Sign: Sign of single-panel configuration; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product.

1. Allstate Sign & Plaque Corporation; Aluminum Traffic & Parking Signs.

C. Materials:

1. Solid-Sheet Sign Panels: Aluminum sheet and as follows:

a. Thickness: 0.080 inch.
b. Surface-Applied Graphics: Applied vinyl film.

2. Posts: Steel embedded in metal bollards.

a. Description: U-channel with baked enamel or powder coated.
b. Installation Method: Direct placement in metal bollard.

3. Text and Typeface: Typeface as selected by Architect from manufacturer's full range and content as scheduled.

4. Reflectivity:

   a. Traffic control, directional and guide signage: Provide high intensity prismatic reflective sheeting (Federal DOT Type III and IV Reflective).
   b. Parking and informational signage: Provide engineer grade prismatic reflective sheeting (Federal DOT Type 1 Reflective).

2.3 MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Steel Materials:

1. U-Channel posts: Powdercoated U-channel steel.

   a. Strength: 3 lbs. per foot
   b. Length: As shown on drawings.

2. Bolts for Steel Framing: ASTM A 307 or ASTM A 325 as necessary for design loads and connection details.

3. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

D. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3,000 psi.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Furnish nonferrous-metal, stainless-steel, or hot-dip galvanized devices unless otherwise indicated.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

1. Increase panel thickness or reinforce with backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.

C. Post Fabrication: Fabricate posts designed to withstand wind pressure indicated for Project location and of lengths required for installation method indicated for each sign.

1. Steel Posts: Fabricate from steel tubing unless otherwise indicated. Include post caps, reinforcement where required for loading conditions, and related accessories required for complete installation.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 METALLIC-COATED STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Provide factory-applied manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to accessibility standard.
3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 53

SECTION 10 26 41 - BULLET-RESISTANT PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Bullet resistant fiberglass panels of the following ballistic rating level:

1. ArmorCore Level 3.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 09 22 16 Non-Structural metal Framing

C. Section 09 20 00 Gypsum Board

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
2. ASTM F 1233 - Standard Test Method for Security Glazing Materials and Systems.

B. International Organization for Standardization (ISO):

1. ISO 9001-2008 - Quality Management System.

C. National Institute of Justice Ballistic Standards (NIJ):

1. NIJ Standard 0108.01.

D. Underwriters Laboratories (UL):

1. UL 752 Specifications and Ammunition, 11th Edition, Standard for Bullet Resisting Equipment published September 9, 2005, revised December 21, 2006.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 - Submittal Requirements

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Details of installation of bullet resistant fiberglass panels.

D. Certificates: Submit printed data to indicate compliance with following requirements.

1. UL Listing Verification and UL752 Current Test Results as provided by Underwriters Laboratories.
2. ASTM E 119.
3. ASTM F 1233.
4. Manufacturer's third party certificate of registration with ISO 9001:2008.
5. Manufacturer's U.S. Dept. of State ITAR Statement of Registration.
6. Manufacturer's SBA Profile verifying small business status by the SBA.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Sourcing: Panels manufactured in the United States of America with raw materials sourced from the U.S.A. for quality assurance purposes and to comply with any applicable "Buy American" provisions.

B. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

C. Installer Qualifications: Minimum 2 year experience installing similar products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
B. Deliver materials to project with manufacturer's UL Listed labels intact and legible.
C. Handle material with care to prevent damage. Store materials inside under cover, stack flat and off the floor.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 WARRANTY

A. Provide manufacturer's standard limited warranty for materials and workmanship against defects for a period of ten years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: ArmorCore by Waco Composites, which is located at: P. O. Box 20008; Waco, TX 76702-0008; Toll Free Tel: 866-688-3088; Tel: 254-752-3622; Fax: 254-752-3634; Email: request info (sales@armorcore.com); Web: www.armorcore.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 BULLET RESISTANT PANELS

A. General:

1. Bullet Resistant Fiberglass Panels shall be "non-ricochet type" to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.

2. Bullet resistance of joints: Equal to that of the panel.

B. Product: Panels shall be fabricated of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets as manufactured by Waco Composites.

C. Panel Product: ArmorCore Level 3.

1. Panel Rating: UL752 Level 3.
2. Armor Type: NIJ Standard 0108.01 - Type IIIa.
3. Physical Characteristics: 7/16 inch (11.1 mm) thick, 4.8 lbs. per sq.ft. (23.4 kg per sq. m).
4. Panel Size: Maximum size to limit number of seams.
5. Panel Size: 3 feet x 8 feet (914 mm x 2438 mm).
6. Panel Size: 3 feet x 9 feet (914 mm x 2743 mm).
7. Panel Size: 3 feet x 10 feet (914 mm x 3048 mm).
8. Panel Size: 4 feet x 8 feet (1219 mm x 2438 mm).
9. Panel Size: 4 feet x 9 feet (1219 mm x 2743 mm).
10. Panel Size: 4 feet x 10 feet (1219 mm x 3048 mm).
11. Panel Size: 5 feet x 8 feet (1524 mm x 2438 mm).
12. Panel Size: 5 feet x 9 feet (1524 mm x 2743 mm).

13. Panel Size: 5 feet x 10 feet (1524 mm x 3048 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Prior to starting installation, verify work of related trades required in contract documents and architectural drawings is complete to the point where work of this Section may properly commence.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

B. Reinforce joints with a back-up layer of bullet resistive material. Minimum width of reinforcing layer at joint shall be 4 inches (102 mm), centered on panel joints.

C. Install panels in accordance with manufacturer's printed recommendations and as required by contract documents.

D. Secure armor panels using screws, bolts, or an industrial adhesive.

E. Method of application shall install panels minimizing vulnerabilities by fitting tightly to adjacent surfaces including concrete floor slab, concrete roof slab, bullet resistive door frames, bullet resistive window frames, and other assemblies.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10 26 41

SECTION 10 28 00 - TOILET AND SHOWER ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Toilet accessories.
2. Electric hand dryers.
3. Childcare accessories.
4. Custodial accessories.

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "As-Specified Verification Form" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Toilet tissue dispenser.
2. Paper towel dispenser (roll).
3. Soap dispenser, vertical type.
4. Grab bar.
5. Sanitary-napkin and tampon dispenser.
6. Mirror, glass.
7. Shelf, metal, heavy-duty.
8. Mop and broom holder.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.
B. Warranty: Executed special warranty.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to correct or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 15 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Electric Hand Dryers: Manufacturer agrees to correct or replace hand dryers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Not less than 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 TOILET ACCESSORIES

A. Source Limitations: Obtain toilet accessories from single source from single manufacturer.

B. Toilet Tissue Dispenser TTD:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. American Specialties, Inc.; 0030.
b. Bobrick Washroom Equipment, Inc.; B-2888.
c. Bradley Corporation; 5402.

2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.

3. Mounting: Surface mounted.

4. Operation: Noncontrol delivery with theft-resistant spindle.

5. Capacity: Designed for 5-inch-diameter (or greater) tissue rolls.

6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Paper Towel Dispenser (Roll) PTDR:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. American Specialties, Inc.; 8522.
b. Bobrick Washroom Equipment, Inc.; B-2860.
c. Bradley Corporation; 2483.

2. Description: Mechanism permitting controlled delivery of paper rolls in preset lengths.

3. Mounting: Surface mounted.

4. Minimum Capacity: 8-inch-wide, 800-foot-long roll.

5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

6. Lockset: Tumbler type.

D. Soap Dispenser SD:

1. Vertical Type:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) American Specialties, Inc.; 0347.
2) Bobrick Washroom Equipment, Inc.; B-2111.
3) Bradley Corporation; 6562.

b. Description: Designed for dispensing soap in liquid or lotion form.

c. Mounting: Vertically oriented, surface mounted.

d. Capacity: 40 oz.

e. Materials: Stainless steel, ASTM A480/A480M No. 4 finish (satin), with corrosion-resistant valve.

f. Lockset: Tumbler type.

g. Refill Indicator: Window type.

E. Grab Bar GB:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. American Specialties, Inc.; 3800-P Series.
b. Bobrick Washroom Equipment, Inc.; B-6806.99 Series.
c. Bradley Corporation; 812-2 Series.

2. Mounting: Flanges with concealed fasteners.

3. Material: Stainless steel, 0.05 inch thick.

a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/2 inches.

5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin and Tampon Dispenser SNTD:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Specialties, Inc.;0864-F.
    b. Bobrick Washroom Equipment, Inc.; B-2706C.
    c. Bradley Corporation;4017-11-40.

2. Mounting: Surface mounted.

3. Capacity: Minimum 20 napkins and 27 tampons.

4. Operation: No coin (free).

5. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

6. Lockset: Tumbler type with separate lock and key for coin box.

G. Mirror, Glass MG:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Specialties, Inc.; 0620-B.
    b. Bobrick Washroom Equipment, Inc.; B-1658.
    c. Bradley Corporation; 781-2.

2. Frame: Stainless-steel channel.

    a. Corners: Manufacturer's standard.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

    a. Wall bracket of steel, equipped with concealed locking devices requiring a special tool to remove.

4. Mirror Glazing: Tempered clear glass.

5. Size: 18” x 30”.

2.3 CHILDCARE ACCESSORIES

A. Height Adjustable Adult-Changing Station:

1. Surface-Mounted Adjustable Height Changing Station :

2. Basis of Design: Model KB3000-AHL as manufactured by Koala Kare Products, a Division of Bobrick.

3. Powered-Height Adjustability: Changing surface shall electronically adjust from 12" (300mm) to 41" (1,041mm) from floor.

4. Unit shall have two sets of built-in electronic controls for height adjustment. One located on face of wall cover and one on the front of changing surface.

5. Weight Capacity: Tested to support up to 500 lbs. (227 kg.) static load.

6. Changing Surface shall be polyethylene and meet IK10 standard for resistance to high impact and sharp objects.

7. UL certified for US and Canada.

8. Back-Up Battery: Unit shall have a built-in backup battery system that allows for continuous operation in the event of a power interruption.

9. Class 1 electrical system to protect against electrical shock.

10. Emergency Stop: Unit shall include a wall-mounted emergency stop to break power to actuator.

11. Changing Surface shall be a minimum 75 ¼" (1,911mm) long, and 31 ½" (800mm) wide, and can be opened and closed with one-hand.

12. Unit shall have a safety rail with a curved dip in the center for easier patient changing by caregiver. Safety rail rotates and locks under changing bed when in closed position.

13. Unit shall withstand significant exposure to water without damage to electrical components. It shall include a grounded power cord and have a splash-proof control system. Electrical components and wiring shall not come in contact with station users or caregivers.

14. Changing surface shall not have covered areas to help ensure cleanliness.

15. Unit shall have ISO 60601-1 and -2 whole product certification.

16. Durability: Cycle tested through range of motion 28,000 times at 500lbs. Stress tested to 100,000 cycles with 500lbs. bounce load test.

17. Frame shall be constructed of 2" powder coated steel tubing.

2.4 CUSTODIAL ACCESSORIES

A. Shelf, Metal, Heavy-Duty SMHD:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Specialties, Inc.; 0692-524.
    b. Bobrick Washroom Equipment, Inc.; B-295 x24.
    c. Bradley Corporation; 755-24.

2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.

3. Size: 24 inches long by 5 inches deep.

4. Material and Finish: Not less than nominal 0.05-inch-thick stainless steel, ASTM A480/A480M No. 4 finish (satin).

B. Mop and Broom Holder MBH:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Specialties, Inc.; 1315-4.
    b. Bobrick Washroom Equipment, Inc.; B-224 x 36.
    c. Bradley Corporation; 9984.

2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.

3. Length: 36 inches.

4. Hooks: Three.

5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.

6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

    a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
    b. Rod: Approximately 1/4-inch-diameter stainless steel.

2.5 MATERIALS

A. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper-and-theft resistant where exposed, and of stainless or galvanized steel where concealed.

B. Tempered Clear Glass Mirrors: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; nominal 6.0 mm thick.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of accessories.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to comply with specified structural-performance requirements.

C. Shower Seats: Install to comply with specified structural-performance requirements.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
B. Remove temporary labels and protective coatings.
C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguisher.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section and by Division 10 Section “Fire Extinguishers” concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing mounting method and relationships of box and trim to surrounding construction. Include accessories.

1. Non-rated fire protection cabinets.

B. Product Schedule: For fire-protection cabinets. Indicate whether recessed or semi-recessed. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets and fire extinguishers from single source from single manufacturer.

2.2 NON-RATED FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

B. Cabinet Construction: Nonrated.

C. Cabinet Tub Material: Cold-rolled steel sheet.

D. Recessed Cabinet:

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

2. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

a. Croker, a division of Fire-End & Croker Corporation;1620-SS.
b. JL Industries, Inc., a division of the Activar Construction Products Group, Inc.; Cosmopolitan 2035.
c. Larsen's Manufacturing Company; Architectural SeriesSS2712-R.

E. Door and Frame Material: Stainless steel sheet.

F. Door Style: Solid opaque panel with frame.

G. Door Glazing: Tempered float glass (clear).

H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

I. Accessories:

1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER." Lettering color and orientation as directed by Architect.

2. Alarm: Alarm that actuates when fire extinguisher is removed from cabinet and that is powered by batteries.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Safety Technology International, Inc.; Mini Theft Stopper, Model STI-6255, or comparable product.

J. Materials:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304.

a. Finish: ASTM A480/A480M No. 4 directional satin finish.

2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

K. Placement: Provide at all locations, except as otherwise indicated.

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
C. Finish fire-protection cabinets after assembly.
D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at height indicated below:

1. Fire-Protection Cabinets: 40 inches above finished floor to top of cabinet rough opening.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Fasten alarm to inside back surface of fire protection cabinets, located to allow fire extinguisher to rest securely on bottom of cabinet.
2. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful correction by finish touchup or similar minor corrective procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section and by Division 10 Section “Fire Protection Cabinets” concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1. Mounting brackets.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the “As-Specified Verification Form” (attached to Division 01 Section “Submittal Procedures”) for each item listed below, otherwise submit full Product Data for the following:

1. Wet-chemical type (K).
2. Multipurpose dry-chemical type in steel container (ABC).
3. Identification.

C. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

D. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
B. Warranty: Executed special warranty.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to correct or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
b. Faulty operation of valves or release levers.

2. Warranty Period: Minimum of five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet] and mounting bracket indicated.

1. Source Limitations: Obtain fire extinguishers and fire-protection cabinets from single source from single manufacturer.
2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Wet-Chemical Type (K): UL-rated 2-A: K, 1.6-gal. nominal capacity, with potassium acetate/citrate/carbonate-based chemical in stainless-steel container; with pressure-indicating gage.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

a. Ansul by Johnson Controls Company; K-Guard K01-3.
b. Croker, a division of Fire-End & Croker Corporation; 4834.
c. JL Industries, Inc., a division of the Activar Construction Products Group, Inc.; Saturn 15.
d. Larsen's Manufacturing Company; WC-6L.

2. Placement: On mounting bracket.

a. Provide in Kitchen, in locations indicated, and in compliance with requirements of authorities having jurisdiction.

C. Multipurpose Dry-Chemical Type in Steel Container (ABC): UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to:

a. Croker, a division of Fire-End & Croker Corporation; 4010.
b. JL Industries, Inc., a division of the Activar Construction Products Group, Inc.; Cosmic 10E.
c. Larsen's Manufacturing Company; MP10.

2. Placement: In fire extinguisher cabinet.

a. Provide in locations indicated and in compliance with requirements of authorities having jurisdiction.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2.4 IDENTIFICATION

A. Identification: Projecting sign complying with authorities having jurisdiction for size and location. Locate as indicated by Architect.

1. Identify fire extinguishers and fire extinguisher cabinets with graphic fire extinguisher image applied to projecting mounting surface.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Compliance Signs, Inc.; Red 3D Triangle-Mount (Graphic Only) Fire Extinguisher Sign NHE-13844Tri, or comparable product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: Top of fire extinguisher to be at 40 inches above finished floor.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

C. Identification: Fasten projecting signs on wall centered above each fire extinguisher and fire extinguisher cabinet, aligning top of sign with top of adjacent door frame, unless otherwise indicated.

END OF SECTION 10 44 16

SECTION 10 75 00 - FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes ground-mounted flagpoles made from aluminum.

B. Related Sections:

1. Section 32 13 13 “Concrete Paving”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.

1. Include section, and details of foundation system for ground-mounted flagpoles.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

B. Warranty: Provide manufacturer's standard limited warranty that states that the product will remain free from defects in material and workmanship including corrosion for a period of one year from date of purchase.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pole-Tech Company Inc.
2. American Flagpole; a Kearney-National Inc. company.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
3. Provide self-aligning, snug-fitting joints.

B. Exposed Height: 30 feet.

C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch- diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

1. Provide flashing collar of same material and finish as flagpole.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch spun aluminum with gold anodic finish.

B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

1. Provide two halyards and two cleats at each flagpole.
2. Provide cast-metal cleat covers, finished to match flagpole, secured with cylinder locks.
3. Provide halyard covers consisting of a 2-inch channel, 60 inches long, finished to match flagpole.
4. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

2.4 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

C. Sand: ASTM C 33, fine aggregate.

D. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Section 07 92 00 "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, for Use O.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

EXECUTION

2.7 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.8 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to manufacturer's written instructions.

B. Ground Set: Place sleeve, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level sleeve and allow concrete to cure. Install flagpole, plumb, in sleeve.

1. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 10 75 00

SECTION 11 40 00 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of the contract, including general and supplementary conditions, apply to the work of this section.

1.2 DESCRIPTION

A. Work Included:

1. The work of this section includes furnishing all labor, materials, transportation, appliances, and services necessary to complete all kitchen equipment and related work required by the drawings and/or herein specified, including, but not limited to, the following:

a. Furnishing, delivering, and setting in place of all food service equipment in spaces as shown and/or as hereinafter itemized.

b. All items of work reasonably inferred as necessary to complete the work of this section. Supply all necessary bolts, hangers, and brackets. Provide cut outs in equipment as necessary for electric, plumbing, or other utility lines required for hook up of the item.

c. All existing equipment not to be reused (Including exhaust hood) shall be removed, and any items the owner does not wish to retain shall become the property of this contractor. This includes removal of all walk-in units, including all removal of refrigeration lines, refrigerant, evaporator coils and condensing units. Should the owner wish to retain an item, then this contractor shall move the item to a storage area as designated by the owner.

B. Related Work Described Elsewhere Performed by Others:

1. Supplying and installing all necessary drain traps, steam traps, vents, shut-offs, valves, pipe fittings, and/or other materials to complete final plumbing and electrical or steam connections between the rough-in and the connection or connections on each piece of equipment.

2. Ductwork and ductwork connections from hoods unless otherwise indicated.

3. Installing all drain fittings, tailpieces, faucets, operating switches, and/or starters.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms regularly engaged in the manufacture of food service equipment of types, capacities, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications:

1. Firm with at least three (3) years of successful installation experience on projects with food service equipment similar to that required for project.

C. Fabricator's Qualifications:

1. Where units require custom fabrication, provide units fabricated by a shop that is skilled with a minimum of five (5) years of experience in similar work. Fabricate all custom equipment items at same shop. Where units cannot be fully shop-fabricated, complete fabrication work at project site. Fabricator shall be subject to the approval of the food service equipment consultant.

D. Codes and Standards:

1. All food service equipment shall be provided, fabricated, and installed in compliance with the following, where such standards have been set: NSF, AGA, UL, ASME, NEMA, NFPA, State Department of Health regulations, and other applicable State, County, and Local governing laws and ordinances.

2. Nothing in the contract documents shall be construed to conflict with any local or state laws or regulations governing the installation of any part of the work to be performed under this contract, and all requirements shall be in accordance therewith, without additional cost to the owner. Installation of equipment must comply with applicable regulations of the local health department.

1.4 SUBSTITUTIONS

A. The materials, products, and equipment items or types shown on the Contract Drawings or listed in this Specification establish the standard of performance, quality, function, dimension, and appearance required. Products, materials, and equipment items not listed herein or on the Contract Drawings but which achieve identical or superior performance to those specified in all aspects but particularly with respect to gender, configuration, and finish are not excluded provided the established criteria described and required is met and such components are shown to be true equals to the satisfaction of the Owner, Architect, Engineer, and Food Facilities Consultant.

B. The bidder may base his bid or proposal on the use of one or more of these items or an equivalent substitution. If substitutions are proposed, the bid must contain a list of all proposed substitutions. Also, each bidder shall list by Specification Sections, all materials, products, or equipment he proposes to offer as possible substitutions for specified items, together with all information on the product required for a complete review.

C. No additional substitutions will be considered unless substitution is required due to a specified material, product, or equipment being removed from or made unavailable in the market place. Upon such circumstances, additional substitutions will be considered by the Architect, but only at no charge to or at a credit to the Contract amount, and at no change in completion time.

D. A request for substitution constitutes a representation that the submitter:

1. Will coordinate installation and make changes to other work, which may be required for the work to be complete with no additional cost to the Owner or to other Contractors.

2. Waives claims for additional costs or time extension, which may subsequently become apparent.

3. Will reimburse the Owner, Architect/Engineer, and Food Facilities Consultant for review or redesign services associated with reapproval by authorities.

1.5 SUBMITTALS

A. Shop Drawings:

1. Within 45 days after award of contract, and before any kitchen equipment is delivered to the job site, submit complete shop drawings to the architect for approval. Show all conditions where equipment will interface with the work of other trades.

B. Details:

1. Rough-in drawings, showing detailed dimensions of all utility lines for all equipment, shall be furnished and drawn to a scale of not less than ¼" to 1'-0". Rough-in drawings shall contain the following *individual* drawings:

   a. A layout drawing showing all food service and related equipment with all items properly marked as to item number.
   b. An individual mechanical layout drawing for each of the mechanical trades; i.e.: Electrical, Plumbing and Heating/Ventilating.
   c. A drawing showing any required recesses in the floor for walk-ins etc.

2. Furnish shop drawings with details showing all dimensions and details of construction, installation, and related work. Shop drawings of fabricated equipment shall be drawn to a scale of not less than ¾" to 1'-0".

3. Manufacturer's names, cuts, descriptive data, rated capacities, and other information necessary for approval of standard manufactured articles and equipment shall be submitted to architect for written approval before ordering or fabricating. Catalog cuts shall be submitted in bound booklet form with ***each*** item (including existing and spare numbers) having its own title sheet before the catalog cut. The title sheet shall contain the item number, quantity, make, model and any and all accessories provided.

4. Submit eight (8) copies of all drawings and catalog cuts (in booklet form) to the architect's office for approval and distribution. The review of any and all drawings and catalog cuts will not relieve the contractor of any responsibility for providing the items, etc. as called for in the specifications.

C. Samples:

1. Samples shall be provided as requested by the architect.

1.6 PRODUCT DELIVERY, HANDLING, AND STORAGE

A. Equipment shall be delivered when required and shall be safely stored on the premises and protected against damage.

B. Deliver all equipment to the job promptly and in such time as not to delay the work of other trades. Cooperate with all other trades in the proper installation of this equipment. Set level, plumb, and true and anchor to floor, walls, or ceiling as required. Leave all equipment ready to receive final plumbing, electric, and ventilation connections, which shall be provided under respective sections.

C. No deliveries shall be made unless this contractor's representative is on the job site to receive same and see that it is properly stored and protected. Neither the owner, construction personnel or architect will receive any equipment or be in any way responsible for same.

D. All responsibilities shall lie with the contractor for damage incurred, loss of materials, and loss of items while in the building or during transportation. Any articles found damaged shall be immediately replaced or repaired at this contractor's expense to the satisfaction of the architect.

E. Kitchen contractor is responsible for all field dimensions and verification for shop drawings, walk-in units and any other equipment that needs field verification. Kitchen Contractor to have Construction Manager present along with General Contractor to verify that the field dimensions are correct.

1.7 JOB CONDITIONS

A. Inspect surfaces to receive work of this section. Report any unsatisfactory conditions to the architect. Proceeding with the work shall be evidence of acceptance of job conditions.

B. Take field measurements to assure accurate fit of all food service equipment.

C. Check electrical characteristics and water, steam, and gas pressures. Provide pressure regulating valves where required for proper operation of equipment.

1.8 GUARANTEES

A. This contractor shall fully guarantee all work and materials for a period of one year from date of acceptance. Should any defect in work or materials, not due to ordinary use, appear in the above-mentioned time, this contractor agrees to repair or replace the same without cost to the owner, as directed, immediately upon written notice of such defect from the owner or owner's previously-identified agent. All refrigerated items shall have an additional four (4) year warranty on all compressors.

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless otherwise called for under the individual items of equipment set forth hereinafter or shown on the details, the general construction called for under each specific material and all detail drawings shall apply to all fabricated equipment.

2.2 METALS

A. Stainless steel shall be AISI type 304, with not less than a #4 mill finish on all exposed surfaces. All welding wire used shall be type 308L. All sheets shall be free of buckles, warps, and surface imperfections.

B. Galvanized iron shall be 1½" x 1½" x ⅛". Where galvanized iron has been welded, all seams shall be cleaned and scale removed and finished with a prime coat of aluminum paint. All galvanize shall be 8% copper bearing alloy with an approved hot dip pure zinc galvanizing.

C. A white metal (commercially known as nickel silver) casting is intended. Such metal to be of corrosion resistant quality and shall contain not less than 30% nickel. All castings shall be rough ground, polished, and buffed to a bright luster, free from pits, cold runs, checks, burrs, or other surface imperfections.

D. Stainless steel pipe and tubing shall be seamless of gauge specified and of true roundness. All tubing, where exposed to view, shall be given a final grind of not less than 180 grit emery.

E. All angles, bands, channels, or other structural shapes used for framing shall be of domestic manufacture, uniform and ductile in quality. Where such sections are specified as galvanized, they shall be galvanized by the hot dip process with all excess spelter removed, and be smooth and free from cold runs, blisters, and uncoated or scaly patches.

2.3 HARDWARE

A. Where equipment is provided with handles, knobs, hinges, brackets, or other miscellaneous hardware, all shall be of either white metal or stainless steel of metallurgical composition previously specified.

2.4 FABRICATION

A. Welding:

1. All welding of stainless steel shall be done by the electric heliarc process. Carbon arc will not be permitted. All welding of galvanized iron shall be done by the electric fusion-metal-arc method. All welding shall be done in a thorough manner with welding rod as specified hereinbefore of stainless steel or of same composition as sheets or parts welded. Welds shall be complete welds, strong and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces. Welds are to be free of mechanical imperfections such as gas holes, pits, runs, cracks, etc., and shall have same color as adjoining sheet

surfaces. All joints in tops of fixtures, tables, drainboards, exposed shelving, sinks, fronts and ends of cabinets exposed to view, etc., shall be completely welded. Butt welds made with solder and finished by grinding will not be acceptable.

2. All welded joints shall be homogeneous with the sheet metal itself. Where sheet sizes necessitate a joint, such joints shall be welded. Tops of fixtures shall be fabricated in the factory with welded joints to reduce field joints to a minimum. Wherever welds occur on surfaces not finished by grinding and polishing, such welds, and the accompanying discoloration, shall be suitably coated in the factory by means of metallic base paint to prevent the possibility of progressive corrosion at such points. All field joints shall be welded, ground smooth, and polished.

B. Soldering:

1. Soldering, where required and/or permitted, shall be done with a solder consisting of no more lead than is allowable by code. Stainless steel requiring soldering shall be first thoroughly cleaned of surface oxides and shall then have applied a suitable stainless steel soldering flux. After the soldering has been completed, excess of remaining flux shall be removed and the entire soldered joint cleaned with liquid alkaline to prevent any attack of the stainless steel by soldering flux.

C. Grinding, Polishing, and Finishing:

1. All exposed welded joints shall be suitably ground flush with the adjoining material and neatly finished to harmonize therewith. Wherever material has been sunken or depressed by a welding operation, such depressions shall be suitably hammered and peened flush with the adjoining surfaces, and, if necessary, ground to eliminate low spots. All ground surfaces consistent with good workmanship. Care shall be exercised in all grinding operations to avoid excessive heating of the metal and metal discoloration. In all cases, the grain of rough grinding shall be removed by a successive finer polishing operation. The texture of the final polishing operations shall be uniform and smooth, consistent with reasonable care and good workmanship. The finish of all equipment shall be of a high grade.

2. Butt joints and contact joints, wherever they occur, shall be close fitting. Wherever brake bends occur, they shall be free of undue extrudence and shall not be flaky, scaly, or cracked in appearance, and where such brake work does mar the uniform appearance of the surface of the material, all such marks shall be removed by suitable grinding, polishing, and finishing. Wherever sheared edges occur, they shall be free from burrs, fins, or irregular projections and shall be finished to obviate all danger of cutting or laceration when the hand is drawn over such sheared edges. Where miters or bullnosed corners occur, they shall be neatly finished with the under edge of material neatly ground to a uniform condition, and in no case are overlapping materials to be acceptable.

3. All exposed surfaces shall have a #4 ground finish, except trim, which is to be of a more highly polished satin finish. Where specified, all cabinets, doors, and shelves, whether inside or outside of cabinets, and wherever exposed are to be #4 finish. This applies to inside finish of any cabinet having doors or otherwise. An exposed surface shall be interpreted as meaning an inside surface exposed to view when a sliding or swinging door is opened. The underside of shelf need not be #4 finish but such finish shall be at least equal to #80 ground finish. The

tops of tables, sinks, dishtables, where manufacturing operations and welding disturb the original #4 finish, shall be finished in a satin finish.

4. Deliver all stainless steel equipment to the job covered with a protective paper coating. Remove this coating when directed by the architect and restore any surfaces that are scratched or marred to their original finish, and to the approval of the architect.

D. Stainless Steel Tops:

1. Where specified, all tops shall be constructed of not less than 14 gauge stainless steel, with all edges rounded without burrs or excess metal. All edges shall be rolled on 180° roll 1½" in diameter on all exposed sides. Where tabletops are placed against wall, refrigerators, cabinets, etc., they shall be turned up on the back and/or sides approximately 6" and returned 2" on a 45° break, with all exposed ends closed, welded, ground, and polished. All corners shall be reinforced on the underside with 1" x 4" x 1" stainless steel channels of not less than 14 gauge stainless steel. These channels shall be spaced not more than 30" apart in any direction and shall give full perimeter as well as interior support.

E. Stainless Steel Legs:

1. All legs shall be constructed of not less than 1-5/8" OD stainless steel seamless tubing, having a wall thickness of not less than 16 gauge. Stainless steel shall be of type as hereinbefore specified. Legs shall be spaced no more than 6'-0" on center. All legs shall be polished to a uniform finish.

2. Leg mounting shall be inserted into 16 gauge stainless steel conical gussets type 483-58 as manufactured by Standard Keil. Gussets shall be welded around entire circumference continuous, sealing gusset against underbracing channel.

3. All legs shall be provided with stainless steel adjustable feet type A10-0851 as manufactured by Component Hardware, complete with A10-0010 lock ring. Legs supporting sink units shall be fitted with stainless steel flanged feet type A10-0854 with A10-0010 lock ring as manufactured by Component Hardware.

4. Leg crossbracing, where required, shall be constructed of not less than 1" OD stainless steel seamless tubing as previously specified. All crossbracing shall run horizontal and level between legs and forming a box type framing between all legs, approximately 12" above the floor. Crossbracing shall be formed to and fully welded to the legs, with all welds ground and polished. Where one side of the boxed unit bracing is omitted to provide space for carts, bins, etc., the adjacent leg shall be fully braced in the prescribed manner.

F. Undershelving:

1. Undershelving shall be constructed of not less than 16 gauge stainless steel. Each undershelf shall be the full depth of the individual unit. Front edges shall be turned down 1½" and returned ½", sides and rear to be turned up 2". Corners shall be notched at legs and welded, ground, and polished to same. Undershelves, where required, shall be provided with pipe slots of suitable size to accommodate necessary service lines. Slots shall be turned up on all sides to eliminate cutting or defacing of equipment on the job.

G. Drawers:

1. Unless otherwise noted, drawers shall be 20" x 20" x 5" die-stamped 20 gauge stainless steel having all inside corners coved. Drawer body shall be lift-out type. Front of drawers shall be double pan 16 gauge stainless steel exterior and 20 gauge stainless steel interior. Drawer shall be suspended by ball bearing heavy-duty extension slides, Model #9190 as manufactured by Standard Keil Hardware. The drawer slides shall be attached to channel bracing under the tabletop. Drawer pulls shall be Standard Keil #SS-12100.

H. Plumbing Fixtures:

1. Faucets:

a. Furnish faucets on sinks, steamtables, bain maries, water stations and other equipment as shown on plans, details and specifications. Furnish water saving devices where required by local codes. All faucets intended to dispense water for human consumption shall be manufactured of materials that contain no lead intentionally added to the product. Finish shall be polished stainless steel. All faucets specified to have standard lever type handle with internationally coded handle identification buttons (hot and cold) and ADA easy turn stems. All faucets shall have internal stainless steel seats and two part swivel stems. All plumbing fixtures shall be ANSI/NSF 61 sec. 9 certified, CSA Certified, California AB 1953 Compliant, Vermont S152 Compliant, and EPAct 2005 compliant.

2. Pre Rinse Units:

a. Shall have integral spring loaded check stems to prevent cross flow, stainless steel seats in control valve, hose equipped with three ply hydraulic type hose liner, spray valves shall be 1.15 GPM for water conservation, be fitted with backflow prevention device (where required), and furnished complete with nipples, lock nuts, washers for secure and proper installation.

3. Waste Valves:

a. Each sink compartment shall be provided with one ball valve type waste valve. Waste valve shall have a stainless steel rotating ball, two Teflon seals, 1½” and 2” outlet treads. Unless otherwise specified all waste valves shall have overflow tubes and fittings.

4. All faucets, pre rinse units and fixture brand shall be consistent throughout project (except where specified otherwise) and shall be as manufactured by Fisher Manufacturing Company, or **equal** by T&S Brass and Bronze or Dormont.

I. Sinks:

1. Where specified, there shall be single or multiple compartment sinks of size specified or shown on drawings. All sinks to be made entirely of 14 gauge stainless steel; all lengths, widths, and depths as hereinafter specified or as shown on drawings. Backsplash shall be drilled as required to accommodate faucets as specified and shown on drawings. Sink shall be of welded, seamless construction with all joints, crevices, etc., eliminated and all traces of welding

removed. Corners, both horizontal and vertical, shall be rounded to 1" radius with intersections meeting in spherical coves. All edges shall be integrally rolled on 1½" diameter to a 180° closure with front corners fully rounded on outside of roll. Both rear corners to be curved and welded into the upturned splash. Bottoms shall be scored towards outlets to permit complete drainage. Die-stamped recess shall be formed in bottom of each compartment to accommodate waste outlet. In multiple compartment sinks, partitions shall be of coved corner construction consisting of two thicknesses of 14 gauge stainless steel formed from one sheet. Top edge of partition to be rounded on ½" radius, and all corners, where partitions meet the sides, shall be coved. Where partitions occur, there shall be no beads or straps on the outside of sink. Front, bottom, and back of sink shall be constructed of one sheet of metal in order to eliminate crevices between each compartment.

J. Drainboards:

1. Where called for, drainboards shall be of same gauge and material as sink and shall be full width of sink with exposed ends bullnosed. Backs shall be provided with high backsplashes to match backsplashes of sink. The front and ends shall be turned up 3", rolled and made continuous with roll of sink. The drainboards shall be pitched to drain to sink, welded, ground, and polished smooth to make entire unit into one piece. All welding shall be integral, and tack welding or bolted construction will not be acceptable. Support drainboards up to 36" in length by 1" diameter stainless steel tube welded to underside of drainboard and leg gusset. Support drainboards 36" and longer with legs. Cove horizontal and vertical corners with not less than ¾" radius.

K. Dishtables:

1. Fabricate dishtables of 14 gauge stainless steel, with exposed edges formed into 1½" x 190° rolled rim approximately 3" high. Provide built-in pitch of ¼" minimum. Provide 10" high rim of type as indicated in the specifications. Cove horizontal and vertical corners with not less than ¾" radius.

L. Framing:

1. Mount tops on 1½" x 1½" x 1/8" galvanized angle iron or 4" wide x 12 gauge galvanized channels. Mount dishtables and drainboards on 4" wide x 14 gauge stainless steel channels.

2. Run framework around entire perimeter of unit, and crossbrace on 30" centers. For dishtables and drainboards, run framing from front to back at each leg location, and run additional channel lengthwise, located at center of table width and welded to leg channels. Fasten framing to underside of top surfaces with ¼" studs welded at approximately 12" centers. Provide each stud with suitable chrome-plated lockwashers and capnuts, and make stud lengths such that capnuts can be made up tight bringing top down snugly to framing.

M. Enclosed Cabinets:

1. Enclosed cabinets shall be constructed of angle iron frame as hereinbefore specified. Exposed angle shall be 1½" x 1½" x 1/8" stainless steel and concealed angle of galvanized iron. Frame construction shall provide a complete box-like welded frame with tops and fronts reinforced with angle iron on approximately 30" centers. Exterior of cabinets shall be 18 gauge stainless steel with openings, door frames, drawer openings, etc., having butt welded flush

joints. Compressor compartments, refrigerated compartments, and open shelving areas shall have double pan bulkheads with full insulation where required. Where cold pans and other inserts are installed in a cabinet base, an apron shall be provided the full depth of the insert and shall be of the same material as the body. Openings shall be formed in on all sides and reinforced where necessary.

N. Doors:

1. Sliding doors shall be constructed of 18 gauge stainless steel exterior and 20 gauge stainless steel interior, all double pan construction with all corners welded, ground, and polished. Door shall be suspended on overhead track Model #550 as manufactured by Standard Keil. Doors shall be retained at the bottom with a depressing pin Model #1906 as manufactured by Standard Keil. All doors shall be removable and fitted with recessed stainless steel pulls.

2. Hinged doors shall be of same construction as for sliding doors except they shall be mounted on full-length stainless steel continuous type hinges. Doors shall be fitted with recessed stainless steel pulls, permanent magnetic catches, and door locks where indicated. Door face shall be flush with cabinet body.

O. Shelves:

1. Cabinet shelves shall be of 16 gauge stainless steel all welded construction turned up 2" on back and ends and down on front. Bottom shelf shall be extended forward and be turned down at front flush with cabinet body. Fixed intermediate shelves shall be welded to 14 gauge stainless steel brackets, which in turn shall be welded cabinet interior in such a manner as to provide a 1" space between shelf and cabinet at back and ends. Removable shelves shall be set on full perimeter 14 gauge stainless steel channeling.

P. Sinks in Worktops:

1. Sinks incorporated into work surfaces shall be as hereinbefore specified, except rolls, inversions, and backsplashes shall be omitted and the bowl shall be completely welded integrally and flush with the work surface. Each sink shall be provided with drain and waste fitting as hereinbefore specified.

Q. Cold Pans:

1. Fabricate cold pans from 14 gauge stainless steel lining and 20 gauge stainless steel casing. Cove interior horizontal and vertical corners. Insulate sides, ends, and bottom with material thermally equal to 2" thickness of fiberglass. Sweat ½" diameter copper cooling coils to underside of cold pan, and seal in thermostatic material. Turn down counter top 1" into pan. Install completely concealed 1" wide plastic breaker strip. Install 1" chrome plated drain with plug. Provide ½" high false bottom of 14 gauge perforated stainless steel in removable sections.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Prior to installation, verify that kitchen equipment may be installed in accordance with the manufacturer's recommendations; notify the architect in the event of a discrepancy. Do

not proceed until all such discrepancies have been fully resolved unless directed to do so.

3.2 INSTALLATION

A. Procedure:

1. Move equipment into location specified and properly install all equipment per approved shop drawings and in strict accordance with the manufacturer's correct recommendations.

2. Coordinate with electrical and mechanical contractors for their final connection to services required. All final plumbing and electrical connections shall be by electrical and mechanical contractors.

3. Inspect all equipment for compliance and test by cycling equipment through various stages to verify proper operation.

3.3 TESTING AND OPERATING INSTRUCTION

A. After completion of installation, the manufacturer's representative shall test all equipment and instruct kitchen personnel in the use and care of all items of equipment. A representative from this contractor shall be present at time of demonstration(s).

B. Provide two (2) sets of repair and maintenance manuals for each item of mechanically-operated equipment. All brochures shall be bound in booklet form. Also include a list of all service agencies with address and telephone numbers.

3.4 ADJUSTMENT AND CLEANING

A. Upon completion of installation and hook-up of equipment, put each item through a complete operating cycle and verify that all equipment is properly installed and properly operating; verify that all trim is in place; adjust all components as necessary to ensure continued proper operation; remove all labels and protective paper from equipment and remove all packing materials from the job site. Thoroughly clean all equipment.

3.5 PUNCH LIST

A. A representative of this contractor shall be present at time of final inspection(s).

B. This contract only includes one punch list site visit. It is understood that punch list items will be corrected and pictures taken of completed items by Kitchen Contractor. The pictures of completed items shall be emailed to Food Equipment Consultant, Architect, and Construction Manager for review and approval and are also to be submitted for contract record. If another site visit or more must be done by the food Equipment Consultant due to negligence, lack of completion, or defective workmanship of punch list items in a timely manner by Kitchen Contractor, the Kitchen Contractor will be charged for additional trips by Food Equipment Consultant.

PART 4 - LIST OF EQUIPMENT

4.1 ITEM 1 - WALK-IN COOLER/FREEZER/STORAGE UNIT - ONE (1) REQUIRED

A. Walk-in cooler/freezer/storage unit shall be as manufactured by Thermo-Kool, approximately 28'-6" x 18'-9" x 8'-6" high.

B. Walk-in shall be designed and constructed to allow fast and easy field assembly, disassembly, relocation and enlargement by the addition of like modular panels.

C. Wall and ceiling panel widths shall be within 1” increments up to 46” wide. Corner panels shall be 90° angle, 12” x 12”. All panels shall be interchangeable with like panels for fast and easy assembly.

D. All panels shall consist of metal pans formed to precise dimensions. Insulation shall be “foamed-in-place” urethane to bond permanently to complete inner surfaces of both interior and exterior metal pans to form strong rigid unit. Panels shall not have internal wood or metal support, framing, straps, or other non-insulating members. Each panel shall be 100% urethane foam insulation exclusive of metal pans. Perimeter structure shall be formed of DURATHANE, high density urethane insulation forming tongues and grooves to assure vapor and airtight joints and to prevent pre-installation damage and deterioration of exposed urethane surfaces.

E. Panels shall be covered by a ten (10) year factory warranty.

F. Insulation shall be 4” thick rigid urethane, low ozone-depleting HCFC-22 blown foamed-in-place to inner surface of metal pans. Urethane foam to have a thermal conductivity (K factor) of not more than 0.125 BTU/hr/sq.ft. per degree Fahrenheit/inch; and an overall coefficient of heat transfer (U factor) of not more than .031. “R” factor shall be 32.

G. Prefabricated urethane foam panels shall be supplied with a Class I fire hazard classification per UL-723 (ASTM-E-84) as tested by Underwriters Laboratories. Panels shall have a flame spread of 25 or less and a smoke density of 250. This rating is not intended to reflect hazards presented by this or any other material under actual fire conditions

H. All exterior and interior surfaces shall be .040 stucco embossed aluminum. Interior ceiling shall be white aluminum.

I. Assembly of walk-in shall be accomplished by “Insta-Loks” consisting of cam-action hook arm assembly set in one panel and a self-aligning, self-centering, pin assembly set in the matching panel. All vertical joints must have a minimum of three Insta-loks. Rotation of the cam-action hook arm shall pull and lock panels together to form airtight, vapor proof joints. No metal straps or connecting rods shall be used inside the panels. Rotation of the cam-locks shall be operated from inside the walk-in through access ports that are sealed with vinyl snap-in closures.

J. NSF listed double-bead vinyl gasket shall be applied to the tongue side of all panels, on both interior and exterior. Gaskets shall be impervious to stains, grease, oils, mildew, sunlight, etc.

K. Non-refrigerated room to be same construction as remainder of walk-in units and integral to the whole structure. Threshold plates to be at each opening into building and secured as per manufacturers recommendations.

L. Walk-in compartments shall be equipped with standard size 34” x 76” hinged-type, flush-mounted entrance door mounted in a nominal 4’, 5’ or 6’ frame and located in exact location as shown on drawing. Door placement shall be within 1” increments to meet shelving space requirements. Door shall be manufactured to accommodate floor construction. Door and frame shall be listed by Underwriters Laboratories and bear the UL Seal of Approval.

M. Door shall be equipped with a one-piece perimeter PVC accordion type removable gasket with magnetic core at the top and along the side perimeter of the door. An adjustable wiper gasket shall be mounted along the bottom edge of the door.

N. Latch shall be break-away type with cylinder lock and inside safety release handle so the door can be opened from the inside even if locked. A positive action hydraulic door closer shall be included to ensure gentle closing action of door to opening and to ensure positive closing of door. The latch shall be of high-pressure zinc die cast with highly polished chrome finish.

O. Hinges shall be 9” modified strap, cam-lift, self-closing design with door lift off capability of high-pressure zinc die cast with highly polished chrome finish. Provide three (3) hinges on each door.

J. Door frame shall consist of heavy reinforced steel “U” channel frame to encompass entire perimeter of opening, foamed-in-place to give extra support and rigidity to frame and to prevent racking, distortion, warping and twisting. A backup must be welded for added strength.

K. An armored anti-sweat heater cable shall be run in a breaker strip located behind a removable heavy gauge stainless steel trim for easy access to heater cable. Heater cable shall be run under threshold consisting of heavy reinforcement “U” channel breaker strip and heavy gauge stainless steel threshold.

L. Door sections shall be provided with an operating three (3) way toggle switch and pilot light mounted on the exterior side of the door frame. An incandescent vapor proof light and face mounted inlet box shall be mounted on the interior side of the door frame for 115 volt, 60 cycle, 1 phase AC service. All wiring shall be in concealed rigid conduit. A 2½” diameter chrome face, flush mount, dual reading, adjustable dial thermometer shall be provided on exterior of door section to provide temperature reading of -40° C to +150° C. Also provide one (1) LED 4’-0” low-temperature light fixture, completely wired to the light switch in cooler and freezer. Provide two (2) LED 4’-0” lights in non-refrigerated space, completely wired to light switch.

M. Doors shall have aluminum diamond treadbrite kickplates, 36” high, on the interior and exterior. Diamond tread kickplates shall be mounted with adhesive and sealed with silicone. No external fasteners such as screws or pop rivets shall be applied as fastening for the diamond tread kickplates.

N. Freezer shall be equipped with a two-way heated pressure relief vent to equalize pressure between the interior and exterior caused by defrost cycles and opening of door. Electrical service to be 115v/60/1 phase.

O. Walk-in floor shall be fabricated similar to other panels and be designed to withstand uniformly distributed stationary loads of 600 lbs. per square foot. Interior surface of floor panels to be foamed-in-place ⅛” aluminum treadplate. Interior surface of floor to be even with interior building floor and outside loading dock when completed.

P. Trim matching the walk-in finish and fabricated to fit building conditions shall be supplied to close all joints between walk-in and building walls. Enclosure panels matching the walk-in finish shall be supplied to close off space between top of walk-in and ceiling above.

Q. For weatherproof/outdoor application, the walk-in shall be provided with a single-ply vinyl weathercap. The weathercap shall consist of a waterproof, durable, high-tenacity fabric membrane. Weathercap shall overlap walk-in panels or turn up at building wall 6” on all sides. A fascia bar with cover shall be provided to secure weathercap to walk-in. Sloped foam consisting of expanded poly-styrene and a 4 mil polyethylene slip-sheet shall be provided with weathercap. The polyethylene shall be installed between the vinyl weathercap and the sloped foam. The sloped foam roof is necessary to provide proper drainage from the top of the walk-in. All installation hardware, trim and flashing shall be provided to secure weathercap to walk-in and against building wall.

R. Provide roof curbs and condenser unit racks on top of box. Constructed per manufacturer’s recommendations.

S. Walk-in shall be equipped with bumper rails to prevent damage in heavy traffic areas on interior and exterior. Bumper rails shall be 4” wide metal rail with vinyl/acrylic insert for field mounting with unexposed screws.

T. Walk-in shall be equipped with a Weiss #XWA11V audio-visual alarm system that activates when temperature rises above desired setting. Alarm sensor is to be located in the return air stream of evaporator coil. Control panel shall be located at front of walk-in. When temperature rises above predetermined setting a red light and buzzer will activate.

U. Cooler and freezer sections shall be provided with BlueZone Food Preservation Units.

V. The walk-in shall be constructed in accordance with National Sanitation Foundation, Standard No. 7. The NSF approval seal shall be affixed to the serial plate of the walk-in.

W. Walk-in shall be set up at the manufacturer’s facility prior to shipment and a quality control inspection performed on the product. A report of the inspection, along with digital photographs of the walk-ins set up at the manufacturer’s facility, shall be provided for the Foodservice Equipment Contractor’s permanent records.

X. Provide and install a Berner #SLC07-1036A-A-SS air door with walk-in cooler kit above each interior door. Verify clearance requirements and provide appropriate low profile unit if necessary. Provide wall backing and reinforcement in door panel to accept weight of air door.

Y. The walk-in shall be completely set up and left in operating order.

4.2 ITEM 2 - REFRIGERATION SYSTEM - ONE (1) LOT

A. Refrigeration systems shall be provided by Thermo-Kool, sized as follows:

1. Cooler - #RFON150E4AEANT/RAL6A141A-DARSF - Sized for 35°
2. Freezer - #RFON400L4AEANT/RAL6E129DDARSF - Sized for -10°

B. Refrigeration units shall be provided with ECONET 2.0 Controller.

C. Refrigeration systems shall consist of hermetic or semi-hermetic type condensing unit. Refrigerant used shall be of the latest type available and shall meet all codes and

governmental requirements. All condensing units shall be factory assembled using UL listed or recognized components. Evaporators shall be forced air type, designed for ceiling installation. Freezer evaporators shall come with automatic electric defrost system with time clock, fan delay thermostat, heaters and heated drain pan. Evaporators shall be UL listed or recognized. Systems shall be installed with nylon bolts provided.

D. The condensers shall be located on the roof of the building above. Provide any and all necessary outdoor controls and weatherproof housings as may be required.

E. It shall be the responsibility of this contractor to completely install all refrigeration piping and controls (including interconnection of all electric) and drain lines from coils in rigid copper to the floor drain, leaving the unit ready for final connections only by other trades. Drain line heater for freezer shall be supplied and installed by this contractor.

F. Roof curbs shall be furnished by this contractor and installed by others. Provide Roof Products, Inc Model #RPES-3 equipment support, 18 gauge galvanized steel construction; 2x4 pressure treated wood nailers; vertical C-channel bulkheads; one-piece outer shell with welded corners; 18-gauge galvanized counterflashing. All welds micro shall be sealed and prime painted after fabrication. Provide two (2) supports per condensing unit: 48” - 42” long x 16” tall (size per manufacturer recommendations).

4.3 ITEM 3 - FREEZER SHELVING - ONE (1) LOT

A. Freezer shelving shall be as manufactured by Metro, Model #ANK3.

B. Freezer shelving shall be provided with MetroSeal3 finish, four (4) shelves high with 74” posts. Freezer shelving shall be provided with all standard equipment in sizes as shown on drawing.

C. It shall be the responsibility of this contractor to verify and adjust shelving sizes to ensure proper fit.

4.4 ITEM 4 - FREEZER DUNNAGE - ONE (1) REQUIRED

A. Freezer dunnage shall be as manufactured by New Age, Model #2010.
B. Freezer dunnage shall be provided with all standard equipment.
C. It shall be the responsibility of this contractor to verify and adjust size to ensure proper fit.

4.5 ITEM 5 - COOLER DUNNAGE - ONE (1) REQUIRED

A. Cooler dunnage shall be as manufactured by New Age, Model #2033.
B. Cooler dunnage shall be provided with all standard equipment.
C. It shall be the responsibility of this contractor to verify and adjust size to ensure proper fit.

4.6 ITEM 6 - MILK CRATE DOLLY - ONE (1) REQUIRED

A. Milk crate dolly shall be as manufactured by SPG/Kel-Max, Model #4J0282.
B. Milk crate dolly shall be provided with all standard equipment, plus pull handle.

4.7 ITEM 7 - COOLER SHELVING - ONE (1) LOT

A. Cooler shelving shall be as manufactured by Metro, Model #ANK3.

B. Cooler shelving shall be provided with MetroSeal3 finish, four (4) shelves high with 74” posts. Cooler shelving shall be provided with all standard equipment in sizes as shown on drawing.

C. It shall be the responsibility of this contractor to verify and adjust shelving sizes to ensure proper fit.

4.8 ITEM 8 - DRY STORAGE SHELVING - ONE (1) LOT

A. Dry storage shelving shall be as manufactured by Metro, Model #ANK3.

B. Dry storage shelving shall be provided with brite finish, five (5) shelves high with 86” posts. Dry storage shelving shall be provided with all standard equipment in sizes as shown on drawing.

C. It shall be the responsibility of this contractor to verify and adjust shelving sizes to ensure proper fit.

4.9 ITEM 9 - ANGLE RACKS - TWO (2) REQUIRED

A. Angle racks shall be as manufactured by Piper, Model #RIU69-12.

B. Angle racks shall be provided with all standard equipment, plus the following:

1. Vertical Bumpers
2. Casters with Brakes

4.10 ITEM 10 - UTILITY CARTS - TWO (2) REQUIRED

A. Utility carts shall be as manufactured by Piper, Model #1-UCS-3.

B. Utility carts shall be provided with all standard equipment, plus the following:

1. 14 Ga. Stainless Steel Shelves
2. Casters with Brakes

4.11 ITEM 11 - DRY STORAGE DUNNAGE - THREE (3) REQUIRED

A. Dry storage dunnage shall be as manufactured by New Age, Model #’s as follows:

1. One (1) #2008, 24" x 36" Rack
2. Two (2) #2009, 24" x 48" Racks

B. Dry storage dunnage shall be provided with all standard equipment.

C. It shall be the responsibility of this contractor to verify and adjust sizes to ensure proper fit.

4.12 ITEM 12 - EXHAUST HOOD - ONE (1) LOT

A. Exhaust hood shall be as manufactured by Halton, Model #KVE.

B. Furnish and install a complete kitchen exhaust canopy. The hood shall be an Exhaust canopy. Halton Model KVE - Wall Mounted style as manufactured by the HALTON Company of Scottsville, Kentucky. The canopy shall bear either the ETL or Underwriters Laboratories U.L. label, for listed range hood without exhaust fire damper per standard 710 and be fabricated in compliance with NFPA-96-2001 and shall bear the National Sanitation Foundation seal of approval.

C. All exposed surfaces shall be 18-gauge stainless steel with a #4 brushed finish, double shell end walls and face construction. **Single wall construction will not be permitted. Hood shall be UL Listed and labeled for "zero clearance" at the end(s) of the hood as shown on drawings when mounted against a wall.** Unexposed surfaces are 18-gauge stainless steel. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes. The hood height shall not exceed 24"H. The overall lengths of the hoods shall be as indicated on drawings and/or equipment schedule. Use of Capture Walls to create a seal between cooking equipment and wall shall not be used as they require cooking equipment to be located further from wall reducing isle space. Bottom edge of hood front panels to be square, chamfered front shall not be allowed as they reduce front overhang and jeopardize capture and containment over tall cooking equipment. Hood to include s/s trim panels from top of hood to finished ceiling on all open sides. Hood shall also include a 12" W by depth of hood fire cabinet to house Ansul tanks, etc. as shown on contract drawings.

D. Seams and joints shall be welded liquid tight in accordance with National Fire Protection Association (NFPA) bulletin #96. Exposed external welds shall be ground and polished to match the original material finish. The hood shall be Underwriters Laboratories (UL) Listed 710. Construction shall conform to the requirements of National Sanitation Foundation (NSF) standard 2 and the NSF seal shall be displayed on the front face of the hood. Hanger brackets shall be threaded ½-13 and located on approximately five-foot centers.

E. Hood will include an active internal "Capture-Jet" System on all open sides of the hood that will allow for Capture and Containment of thermal plume at specified air volumes. The Capture Jet air shall be pulled into a 1" air plenum with the Capture-Jet fan and discharged through Capture-Jet ports that are located along the inside front, side and bottom edge of the hood at discharge velocity of 1800 FPM. Slot type, passive devices or "Short-Cycle" discharge is not acceptable.

F. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning. The hood shall be equipped with Halton KSA (High Efficiency) multi-cyclone Stainless Steel grease extractors. The KSA filters shall be NSF and UL classified. The particulate extraction efficiency is 93% on particulates of 5 microns and 98% on particles with a diameter of 10 microns or larger per ASTM F2519 method of test. The pressure loss over the extractor shall not exceed 0.50 inches W.C. at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle, adjustable or slot type extractors shall not be acceptable.

G. The airflows through the KSA extractors and the Capture Jet air chamber are to be determined through the integral T.A.B. (Testing and Balancing) ports located on the outside end of the exhaust plenum inside each hood section. It is the responsibility of the air

balancer to adjust the exhaust volumes after installation with a Magnahelic Gauge or Shortridge Digital Anemometer and the hood TAB ports to match the Pressure vs Air Flow Curves card provided in each hood section.

H. The exhaust airflow will be calculated based on the convective heat generated by the appliances underneath each canopy. Submittal shall include convective heat calculations based on the input power of the appliance served and efficiency of hood system consistent with results of independent test based on ASTM Standards F-1704-05 Capture & Containment and F-2474-05 Heat Gain to Space. Final air volume calculations shall comply with the hood listing.

I. A hood light and exhaust fan button to be provided by hood manufacturer and located on the front face bottom side of the hood as shown on contract drawings.

J. Hood shall include recessed MUA ceiling plenums and diffusers extending 24" wide and entire length of the hood front as shown on drawings with a white powder coat finish to match the drop ceiling tiles in the kitchen. MUA plenums shall not exceed 150CFM/per lineal foot of plenum using 28% open perforation diffuser material to reduce possibility of air disturbance along the front edge of the hood.

K. Each hood shall be equipped with Halton Culinary LED Lights (HCL). Constructed from stainless steel frame and Aluminum hosing, the light fitting comprises flush mounted broad beam spots with a diffusion angle of at least 80°. Each light is comprised of a patented mixing chamber and a specific reflector. Both shall provide a good balance between direct and diffuse light components without dazzling the staff to mitigate eye fatigue. The shielding angle shall exceed DIN 12464-1 requirement and be at least 30°. The illuminance on the working surfaces shall be 50-foot candles with a CRI Color Rendering Index greater than 80. The wattage per fixture will be 14W, and provide code required 50-foot candles at the cooking surface. The LED's lifetime shall be 50,000 hours. The internal power supplies shall have at least the same lifetime. They shall enable switching on/off or dimming the light (0-100%) with one or several switches. The lights shall be supplied with vapor proof, grease proof, and heat proof UL-listed designed specifically for commercial kitchen hood application.

L. All light fixtures shall be wired in a concealed manner to a junction box on top of the hood. All wiring is in accordance with the National Electric Code (NFPA 70).

M. Hood shall be provided with hood mounted temperature sensor and timer panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.

N. Provide trim strips and enclosure panels above the hood to ceiling above and where hood meets the walls.

O. Halton Model KEFB -14 commercial kitchen exhaust fan shall be a high-velocity upblast belt type. The fan wheel shall be a single width, single inlet plenum fan of welded aluminum, and shall include a wheel cone matched to the inlet cone for precise balancing. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of 18 gauge 304 stainless steel, #2B finish, and continuously welded transition and fan housing.

P. Provide hinged top discharge outlet for easy access for cleaning fan wheel and wheel housing. Provide hinged access to exhaust elbow. No hinged base allowed, fan to be permanently sealed to duct termination. Provide gravity type backdraft damper

Q. Hinged access to motor compartment for convenient access to motor and belt. Motors shall be heavy-duty ball bearing type, matched to the fan load, and furnished at the specified voltage, phase, and enclosure. Motor and Drives shall be out of the airstream. Include spare belt inside motor cabinet. Motor shall have a separate access door and come complete with a belt tensioner and spare belt. Drive frame assemblies shall be constructed of heavy gauge steel.

R. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum of (L10) life in excess of 100,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shaft.

S. Exhaust fan can drain to a grease cup on the roof or to an exhaust duct to effectively contain grease and rainwater, mitigating contamination of the roof and the environment. This effective grease management system also meets the new requirements of many municipalities for stormwater control in commercial kitchens. The standard sealed construction belt drive KEFB with VFD controls and energy-saving backdraft damper provides an energy-efficient and reliable system that is extremely easy to maintain. The liquid -tight welded KEFB design is ideal for heavy grease applications.

T. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed with the motor compartment. A conduit chase shall be provided through the curb cap to the motor compartment for ease of electrical wiring.

U. All KEFB exhaust fans can be fitted with discharge extensions to clear roof parapets or other obstructions and eliminate re-entrainment of the exhaust plume.

V. Provide fan with integral Testing and Balancing ports for ease of commissioning.

W. Each fan shall bear a permanently affixed manufacturer’s nameplate containing the model number and individual serial number for future identification.

X. Fan shall be listed to the following standards: UL 705:2017 Ed.7+R:13Feb2018 Power Ventilators including Supplement SC Power Roof Ventilators for Restaurant Exhaust Appliances [formerly UL Subject 7462); ULC S645:1993 Ed.1 Standard For Power Roof Ventilators For Commercial And Institutional Kitchen Exhaust Systems; CSA C22.2#113:2018 Ed.11 Fans And Ventilators.

Y. Supply a Halton model MUA-IF-2800-175M non-recirculating indirect-fired gas, heat only make-up air unit ETL listed to ANSI Z83.4/CSA 3.7 for indoor and outdoor installation and variable airflow. The unit shall be supplied complete with a Burner and Blower module factory assembled and tested along with components, options, and field installed accessories as follows.

Z. The unit shall deliver 2800 CFM at 2.80 in. w.c. total static pressure at a discharge air temperature of 70°F. The unit shall have a natural gas input rate of 76 Btu/hr. (Refer to contract drawings for technical data requirements). The unit shall be provided with the controls cabinet on the left-hand side when facing the intake opening of the unit.

AA. The Burner Module shall have a 20 ga. G90 galvanized steel exterior shell, 14 ga. G90 galvanized steel base frame, burner supports, and lifting lugs. The module construction shall be suitable for outdoor installation. The Burner Module shall have burner profile plates capable of being adjusted in the field during startup and commissioning to optimize burner performance across the designed airflow rate range. The module shall include an integral controls cabinet with a factory-installed main electrical power disconnect and

optional factory-mounted exterior weatherproof junction box for the main power connection. The module shall include removable access doors with hinges and gasket seals to allow access to the controls cabinet and burner. The Burner Module shall have a motorized intake air damper with leakage rates complying with ASHRAE 90.1.

AB. The Burner shall be an indirect-fired two-stage combustion burner constructed of cast aluminum burner sections with stainless steel burner plates and an efficiency of 81%. The Burner shall have a factory-installed direct spark for gas trains up to ¾" diameter and piloted ignition assembly with a flame rod and a spark rod for gas trains 1" and greater. The Burner shall be factory piped to a direct spark or piloted gas valve train as noted. The gas valve train shall have a modulating temperature control ball valve and test ports for optional factory or field-installed gas pressure gauges and/or gas pressure switches.

AC. The Blower Module shall have a 20 ga. G90 galvanized steel exterior shell, 14 ga. G90 galvanized steel base frame, blower supports, and lifting lugs. The module construction shall be suitable for outdoor installation. The module shall include at least one removable access door with hinges and gasket seals to allow access to the blower. The module shall have a discharge opening on either the end or bottom of the module.

AD. The Blower shall be either An EC motor direct drive fan or direct driven backward curved airfoil plenum fan. The Blower shall be AMCA certified, shall be installed on neoprene isolators and shall be powered by a listed or recognized electric ODP or TEFC motor with rolled steel or cast-iron construction.

AE. The EC Motor Driven fan shall be driven by Halton's Supply air algorithm in conjunction with a M.A.R.V.E.L. Demand Controlled Kitchen Ventilation system.

AF. The Blower for a variable airflow unit shall have a pressure port for measuring air flow rate. The blower motor for a variable airflow unit that is not an ECM type, shall be controlled by either a factory-installed or externally supplied and installed VFD.

AG. The unit shall have a single point power connection rated for one of the following voltages: 208/3/60

AH. The unit shall have either a unit mounted means of a call for heat and/or start/stop or connections for a remote mounted call for heat and/or start/stop. The unit shall have an RTC Solutions control system to provide automatic control of the Burner to maintain the desired discharge air temperature. The discharge air temperature shall be set by either unit mounted, remote, or space temperature controller means.

AI. The unit shall be listed for a minimum, without Burner and Blower module insulation, of 0 inches of clearance to combustible materials on the top and bottom of the Burner and Blower modules and a minimum of 1 inch of clearance to combustible materials on the inlet end of the Burner module and discharge end of the Blower module.

AJ. A unit for outdoor installation shall be provided with a factory-built intake hood constructed of 20 ga. G90 galvanized steel with birdscreen and removeable, washable 2" aluminum mesh filters.

AK. The unit shall be provided with an inlet Filter section constructed of 20 ga. G90 galvanized steel with replaceable MERV 8 filters.

4.13 ITEM 13 - FIRE SUPPRESSION SYSTEM - ONE (1) REQUIRED

A. Fire suppression system shall be as manufactured by Ansul, Model #R-102.

B. Fire suppression system shall cover the hood, duct, and any necessary appliances below. Provide all necessary electrical contacts and gas valves as may be required. The fire protection system shall comply to both NFPA96 and NFPA17 requirements.

C. All components to be new from manufacturer, not recertified or remanufactured as new.

D. Furnish a complete wet chemical fire suppression system model R102 as manufactured by “Ansul” or equal in compliance with UL 300 standards. The system shall include factory prepipe, all permits and test as required by the authority having jurisdiction.

E. Automatic actuation shall be by means of fusible with no visible conduit.

F. System shall be furnished and installed by an Ansul certified distributor in accordance with manufacturer's instructions and the authority having jurisdiction.

G. Microswitches shall be furnished as part of the fire protection system for tie in of building alarm and for make-up air/fire/fuel shut down.

H. All access openings, holes, sleeves, chases, etc., in building structure necessary to permit piping and control tubing to be run between system unit, ventilator and duct work are to be provided by the General Contractor.

I. The Building Alarm System Contractor is to furnish a control relay to detect operation of the system by connection to the microswitches supplied. The Electrical Contractor is to furnish shunt trip breakers as required and install all wiring required for the system specified.

J. All exposed piping and nozzles of fire protection system shall be chrome or Stainless steel sleeved.

K. All horizontal piping is to be done on the top of the ventilator unless otherwise specified.

4.14 ITEM 14 - RANGE - ONE (1) REQUIRED

A. Range shall be as manufactured by Garland, Model #M4S.

B. Range shall be provided with all standard equipment, plus the following:

1. Rear Gas Connection
2. End Caps and Cover
3. 10" Backguard
4. Gas Regulator
5. Krowne #MK12 Gas Hose Kit with Disconnects

4.15 ITEM 15 - CONVECTION OVEN - ONE (1) REQUIRED

A. Convection oven shall be as manufactured by Garland, Model #MCO-GD-20S.

B. Convection oven shall be provided with all standard equipment, plus the following:

1. One (1) Extra Oven Rack Per Deck
2. Casters with Brakes
3. Krowne #MK12 Gas Hose Kit with Disconnects
4. Krowne #28-200 Caster Positioning Chocks

4.16 ITEM 16 - COMBI-OVEN - ONE (1) REQUIRED

A. Combi-oven shall be as manufactured by Rational, Model #Classic 6 Full + 6 Full.

B. Combi-oven shall be provided with all standard equipment, plus the following:

1. Installation Kits
2. Stacking Kit
3. Stand with Casters
4. Positional Aid for Core Temperature Probe
5. Six (6) Gastronorm Grid Shelves Per Section
6. Water Filtration System, Double Cartridge System
7. Active Green Cleaning Tabs
8. Care Tabs
9. Rational Certified Installation
10. Dormont #WBP-2Q Water Hoses
11. Krowne #MK12 Gas Hose Kit with Disconnects
12. Krowne #28-200 Caster Positioning Chocks

4.17 ITEM 17 - HEATED CABINET - ONE (1) REQUIRED

A. Heated cabinet shall be as manufactured by Metro, Model #C539-CDC-4-GY.
B. Heated cabinet shall be provided with all standard equipment.

4.18 ITEM 18 - HAND SINK - ONE (1) REQUIRED

A. Hand sink shall be as manufactured by Advance/Tabco, Model #7-PS-68.

B. Hand sink shall be provided with all standard equipment, plus the following:

1. #7-PS P-Trap
2. Wrist Handles

4.19 ITEM 19 - SPARE NUMBER

4.20 ITEM 20 - COOK'S COUNTER - ONE (1) REQUIRED

A. Cook's counter shall be Custom built Keystone Fabrication Elizabethtown PA, approximately 8'-6" x 30" x 34” high to working surface.

B. Top shall be constructed of 14 gauge stainless steel with front and left end rolled and corner bullnosed. Rear of top and right end shall be turned up in an 8" high backsplash.

C. Mount to the top, a pot and pan rack, approximately 8’-6” long, constructed by extending the rear table legs through the top to a point 7’-0” above the floor to act as pot rack uprights, which will be bent out 15” on a 12” radius. Two (2) horizontal 2” x ¼” stainless steel bars shall be welded to the uprights. One bar shall be at the end of the uprights and the other below the uprights just below the radius. Provide each bar with stainless steel double pointed adjustable pot hooks on 8” centers, welded in place. Uprights shall extend through the top to the bottom shelf and anchor to stainless steel gusset welded to shelf.

D. Mount above the top, a 14 gauge stainless steel shelf approximately 8’-6” x 12” with rolled edge on all sides. Shelf shall be supported by 1⅝” stainless steel pot rack uprights. Provide 14 gauge stainless steel cantilevered brackets welded to uprights. Top of shelf shall be 18” above the top. See Detail #12.4.

E. Under the top provide two (2) tool drawers with locks and cutting board as per Detail #6.2.

F. The worktable shall be supported on 1⅝" OD stainless steel legs with undershelf (Detail #3.1).

4.21 ITEM 21 - SPARE NUMBER

4.22 ITEM 22 - SPARE NUMBER

4.23 ITEM 23 - WORKTABLE WITH SINK - ONE (1) REQUIRED

A. Worktable shall be custom built by Keystone Fabrication Elizabethtown PA, approximately 8'-6" x 30" x 34” high to working surface.

B. Top shall be constructed of 14 gauge stainless steel with front and ends rolled and corners bullnosed. Rear of top shall be turned up in an 8" high backsplash.

C. Where shown, provide an integral 20" x 20" x 12" deep all coved corner sink compartment. Sink shall be complete with Krowne #22-204/22-500/22-501 leverwaste with overflow, and Krowne #DX-810 faucet with aerator.

D. Mount to the top, a pot and pan rack, approximately 8’-6” long, constructed by extending the rear table legs through the top to a point 7’-0” above the floor to act as pot rack uprights, which will be bent out 15” on a 12” radius. Two (2) horizontal 2” x ¼” stainless steel bars shall be welded to the uprights. One bar shall be at the end of the uprights and the other below the uprights just below the radius. Provide each bar with stainless steel double pointed adjustable pot hooks on 8” centers, welded in place. Uprights shall extend through the top to the bottom shelf and anchor to stainless steel gusset welded to shelf.

E. Mount above the top, a 14 gauge stainless steel shelf approximately 8’-6” x 12” with rolled edge on all sides. Shelf shall be supported by 1⅝” stainless steel pot rack uprights. Provide 14 gauge stainless steel cantilevered brackets welded to uprights. Top of shelf shall be 18” above the top. See Detail #12.4.

F. Under the top provide two (2) tool drawers with locks and cutting board as per Detail #6.2.

G. The worktable shall be supported on 1⅝" OD stainless steel legs with 1¼" OD stainless steel crossbracing (Detail #3.2) under sink area and undershelf (Detail #3.1) under balance of the top. Provide legs with adjustable stainless steel flanged feet, secured to floor using stainless steel fasteners.

4.24 ITEM 24 - SPARE NUMBER

4.25 ITEM 25 - WALL SHELVES - TWO (2) REQUIRED

A. Wall shelves shall be custom built Keystone Fabrication Elizabethtown PA, Per Detail #2.1, sized as follows:

1. One (1) 12" x 24" Shelf
2. One (1) 12" x 36" Shelf

B. It shall be the responsibility of this contractor to verify field conditions and adjust sizing as required.

4.26 ITEM 26 - SLICER - ONE (1) REQUIRED

A. Slicer shall be as manufactured by Hobart, Model #HS9-1.

B. Slicer shall be provided with all standard equipment, plus the following:

1. Slicer Removal Tool
2. Product Deflector
3. Product Fence

4.27 ITEM 27 - SLICER STAND - ONE (1) REQUIRED

A. Slicer stand shall be as manufactured by F.W.E., Model #OTR-15-MSWT.

B. Slicer stand shall be provided with all standard equipment, plus the following:

1. Perimeter Bumper
2. Floor Lock

4.28 ITEM 28 - MOBILE WORKTABLE - ONE (1) REQUIRED

A. Mobile worktable shall be custom built Keystone Fabrication Elizabethtown PA, approximately 2'-9" x 30" x 34" high to working surface.

B. Top shall be constructed of 14 gauge stainless steel with all edges rolled and corners bullnosed.

C. Worktable shall be supported on 1⅝" OD stainless steel legs with undershelf (Detail #3.1). Legs shall be provided with 5" heavy-duty casters, all with brakes.

4.29 ITEM 29 - REACH-IN REFRIGERATOR - ONE (1) REQUIRED

A. Reach-in refrigerator shall be as manufactured by Continental Refrigerator, Model #D2RNSSPTHD.

B. Reach-in refrigerator shall be provided with all standard equipment, plus the following:

1. One (1) Extra Shelf Per Section
2. Casters with Brakes

4.30 ITEM 30 - POT/PAN SINK - ONE (1) REQUIRED

A. Pot/pan sink shall be custom built Keystone Fabrication Elizabethtown PA, approximately 7'-6" x 30" x 34” high to working surface.

B. Pot/pan sink shall be provided with the following:

C. Sink shall be constructed of 14 gauge stainless steel, one piece welded construction. All interior corners shall be coved horizontal and vertical with a ½" minimum radius. The 16" wide x 20" x 14” deep multiple compartment sinks shall be fabricated with double thickness partitions and continuous front. The bottom of each sink shall be pitched to drain and provided with Krowne #22-204/22-500/22-501 leverwastes with connected overflows. Mounted on the backsplash over the left bulkhead shall be a Krowne #DX-812 faucet with aerator. Mounted above the other bulkhead shall be a Krowne #DX-109 pre-rinse with wall bracket and add-on faucet. Securely fasten bracket to the wall using stainless steel fasteners.

D. Drainboards shall be constructed of 14 gauge stainless steel with 3" high raised roll edge on front and ends. Drainboards shall be welded integrally with sink to form one-piece construction. Drainboards shall be pitched ¼" per foot.

E. Sink unit shall have 10" high backsplash along all wall areas. See Detail #5.0 - Type "A". Unit shall be supported on 1⅝" OD stainless steel legs with crossbracing. See Detail #3.2. Front legs shall have stainless steel adjustable flanged feet, secured to the floor using stainless steel fasteners.

4.31 ITEM 31 - PREP SINK - ONE (1) REQUIRED

A. Prep sink shall be custom built by Keystone Fabrication Elizabethtown PA, approximately 8'-6" x 30" x 34” high to working surface.

B. Top shall be constructed of 14 gauge stainless steel with stainless steel "C" channel top supports stud welded to underside. Top shall have 3" high raised roll at the front and left end with the rear turned up 10" to form backsplash along the walls. The top, where shown, shall have two (2) integral 18" x 27” x 14" deep, all coved corner sinks. Both sinks shall have Krowne #22-204/22-500/22-501 leverwastes with connected overflows.

C. Mounted above the bulkhead between the sinks shall be a Krowne #DX-109 pre-rinse with wall bracket and add-on faucet. Securely fasten wall bracket to the wall using stainless steel fasteners.

D. Provide under the top to the right of the sinks a tool drawer with cutting board as per Detail #6.1.

E. Prep sink shall be supported on 1⅝" OD stainless steel legs with a 16 gauge stainless steel undershelf under the right and left work surfaces. See Detail #3.1. Front legs shall have stainless steel adjustable flanged feet, secured to the floor using stainless steel fasteners.

4.32 ITEM 32 - DRYING RACKS - TWO (2) REQUIRED

A. Drying racks shall be as manufactured by Metro, Model #MAX4-PR48VX2.
B. Drying racks shall be provided with all standard equipment.

4.33 ITEM 33 - TRAY DISPENSERS - TWO (2) REQUIRED

A. Tray dispensers shall be as manufactured by Piper, Model #ATCA-ST.

B. Tray dispensers shall be provided with all standard equipment, plus the following:

1. Perimeter Bumper
2. Casters with Brakes

C. It shall be the responsibility of this contractor to verify tray size with Owner.

4.34 ITEM 34 - JANITOR'S MOP CABINET - ONE (1) REQUIRED

A. Janitor's mop cabinet shall be as manufactured by Advance/Tabco, Model #9-OPC-84DL-300.

B. Janitor's mop cabinet shall be provided with all standard equipment, plus the following:

1. #SU-27 Door Lock
2. #K-94-SHELF Fixed Mid Shelf
3. #K-94-BACK-300 Stainless Steel Back Panel
4. #K-472 Faucet Holes
5. #K-240 Service Faucet

4.35 ITEM 35 - HAND SINK - ONE (1) REQUIRED

A. Hand sink shall be as manufactured by Advance/Tabco, Model #7-PS-68.

B. Hand sink shall be provided with all standard equipment, plus the following:

1. #7-PS P-Trap
2. Wrist Handles
3. #K-170 Eye Wash Unit

4.36 ITEM 36 - CLEAN DISHTABLE - ONE (1) REQUIRED

A. Clean dishtable shall be custom built Keystone Fabrication Elizabethtown PA, approximately 5'-0" x 30".

B. Dishtable shall be constructed of 14 gauge stainless steel with all interior corners coved horizontal and vertical with a ½" radius; front and right end shall have a 3" high raised roll edge.

C. Dishtable shall have a 10" high backsplash along all wall areas.

D. The table limit switch (Item #38) shall be mounted and interwired by this contractor.

E. The dishtable shall be supported on 1⅝" OD stainless steel legs with undershelf (Detail #3.1).

4.37 ITEM 37 - SPARE NUMBER

4.38 ITEM 38 - DISHWASHER - ONE (1) REQUIRED

A. Dishwasher shall be as manufactured by Hobart, Model #CL44-ADV.

B. Dishwasher shall be provided with all standard equipment, plus the following:

1. Electric Tank Heat
2. Built-In Booster
3. Drain Water Tempering Kit
4. Shock Absorbers
5. Splash Shields Each End
6. Table Limit Switch
7. Flange Feet Kits
8. Vent Cowls Each End
9. Water Softening System
10. Three (3) Peg Racks
11. Three (3) Combination Racks
12. Two (2) Sheet Pan Racks
13. Hobart Assurance Unlimited

4.39 ITEM 39 - DUCT RISERS - TWO (2) REQUIRED

A. Duct risers shall be custom built by Keystone Fabrication Elizabethtown PA, 4" x 16".

B. Duct risers shall be custom fabricated of 18 gauge stainless steel. All seams shall be continuously welded, ground and polished to eliminate any leakage of condensation. Ducts shall run from each vent cowl on the dishmachine to a point 3" above finished ceiling.

4.40 ITEM 40 - SOILED DISHTABLE - ONE (1) REQUIRED

A. Soiled dishtable shall be custom built Keystone Fabrication Elizabethtown PA, size and shape as shown on drawing x 34” high to working surface.

B. Dishtable shall be constructed of 14 gauge stainless steel with all interior corners coved horizontal and vertical with a ½" minimum radius; edges shall have a 3" raised roll. Dishtable shall have a 10" high backsplash along wall areas. The top shall be formed into the pass window opening as per Detail #7.6.

C. The dishtable, where shown, shall be provided with a scrapper unit (Item #41). Scrapper unit to be completely welded liquid tight to dishtable per manufacturer's directions. Provide above the sink a Krowne #DX-108 pre-rinse with wall bracket. Securely mount the bracket to the wall with stainless steel fasteners.

D. The table shall be fitted with a full complement of stainless steel roller assemblies. Roller assemblies shall be constructed using 1⅝" OD stainless steel rollers with stainless steel bearings at each end. Roller sections shall be a max of 18" long for ease of removal.

E. The dishtable shall be supported on 1⅝" OD stainless steel legs with 1¼" OD stainless steel crossbracing as per Detail #3.2.

4.41 ITEM 41 - SCRAPPER UNIT - ONE (1) REQUIRED

A. Scrapper unit shall be as manufactured by Salvajor, Model #S914.

B. Scrapper unit shall be provided with all standard equipment, plus the following:

1. Control Mounting Bracket
2. Additional Scrap Basket

4.42 ITEM 42 - GRAB-N-GO COLD FOOD COUNTER - ONE (1) REQUIRED

A. Grab-n-go cold food counter shall be as manufactured by Piper, Model #2BCM.

B. Grab-n-go cold food counter shall be provided with all standard equipment, plus the following:

1. Solid Ribbed Tray Slide, 28" AFF
2. Laminate
3. Mount Display Case (Item #53)
4. Elementary Height (30" High)

C. Color to be as selected by Architect.

4.43 ITEM 43 - ICE CREAM CABINET - ONE (1) REQUIRED

A. Ice cream cabinet shall be as manufactured by Beverage Air, Model #NC34-1-W.
B. Ice cream cabinet shall be provided with all standard equipment.

4.44 ITEM 44 - CASH REGISTER - ONE (1) - NIC/BY OWNER

4.45 ITEM 45 - CASHIER COUNTER - ONE (1) REQUIRED

A. Cashier counter shall be as manufactured by Piper, Model #2-CD.

B. Cashier counter shall be provided with all standard equipment, plus the following:

1. Solid Ribbed Tray Slide, 28" AFF
2. Laminate
3. Tubular Foot Rest

C. Color to be as selected by Architect.

4.46 ITEM 46 - COLD FOOD COUNTER - ONE (1) REQUIRED

A. Cold food counter shall be as manufactured by Piper, Model #3-ST.

B. Cold food counter shall be provided with all standard equipment, plus the following:

1. Solid Ribbed Tray Slide, 28" AFF
2. Laminate
3. Cut Out for Cold Food Display Unit (Item #47)
4. Elementary Height (30" High)

C. Color to be as selected by Architect.

4.47 ITEM 47 - COLD FOOD DISPLAY UNIT - ONE (1) REQUIRED

A. Cold food display unit shall be as manufactured by Duke, Model #HF35-2-FOL-FOL.
B. Cold food display unit shall be provided with all standard equipment.

4.48 ITEM 48 - FLAT TOP COUNTER - ONE (1) REQUIRED

A. Flat top counter shall be as manufactured by Piper, Model #2-ST.

B. Flat top counter shall be provided with all standard equipment, plus the following:

1. Solid Ribbed Tray Slide, 28" AFF
2. Laminate
3. Open Understorage with Shelf

C. Color to be as selected by Architect.

4.49 ITEM 49 - HOT/COLD/FREEZE COUNTER - ONE (1) REQUIRED

A. Hot/cold/freeze counter shall be as manufactured by Piper, Model #5-ST.

B. Hot/cold/freeze counter shall be provided with all standard equipment, plus the following:

1. Solid Ribbed Tray Slide, 28" AFF
2. Laminate
3. Cut Out for Hot/Cold/Freeze Unit (Item #50)
4. Install Protector Guard (Item #52)

C. Color to be as selected by Architect.

4.50 ITEM 50 - HOT/COLD/FREEZE UNIT - ONE (1) REQUIRED

A. Hot/cold/freeze unit shall be as manufactured by Duke, Model #HCF-4.
B. Hot/cold/freeze unit shall be provided with all standard equipment, dry heat with removable non-stick liners.
C. Unit shall be installed in accordance with manufacturer's recommendations in Item #49.

4.51 ITEM 51 - MILK CABINET - ONE (1) REQUIRED

A. Milk cabinet shall be as manufactured by Continental Refrigerator, Model #MC3NSSD.

B. Milk cabinet shall be provided with all standard equipment, plus the following:

1. Wrap-Around Bumper
2. Floor Lock
3. Low Profile Condensor to Allow Milk Crates to Pass Unde

4.52 ITEM 52 - PROTECTOR GUARD - ONE (1) REQUIRED

A. Protector guard shall be as manufactured by Premier, Model #TM2N-A, sized to fit over hot/cold/freeze unit, Item #50.
B. Protector guard shall be provided with all standard equipment, plus LED lights.
C. Protector guard shall be mounted on hot/cold/freeze counter, Item #49.

4.53 ITEM 53 - DISPLAY CASE - ONE (1) REQUIRED

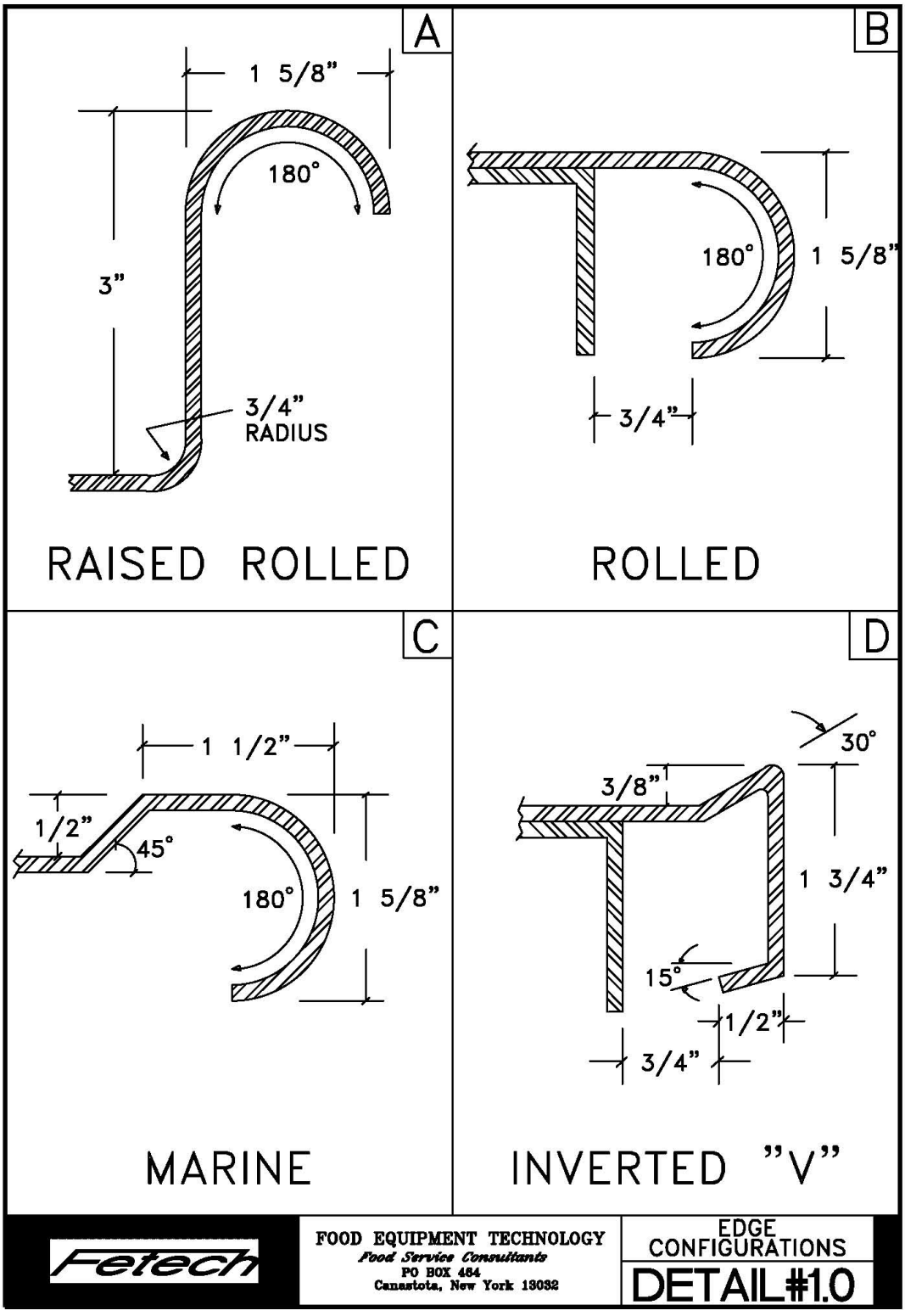
A. Display case shall be as manufactured by Premier, Model #TM2TN-A, sized to fit on grab-n-go display counter, Item #42.
B. Display case shall be provided with all standard equipment, plus LED lights.
C. Display case shall be mounted on grab-n-go display counter, Item #42.

PART 5 - DETAILS OF CONSTRUCTION

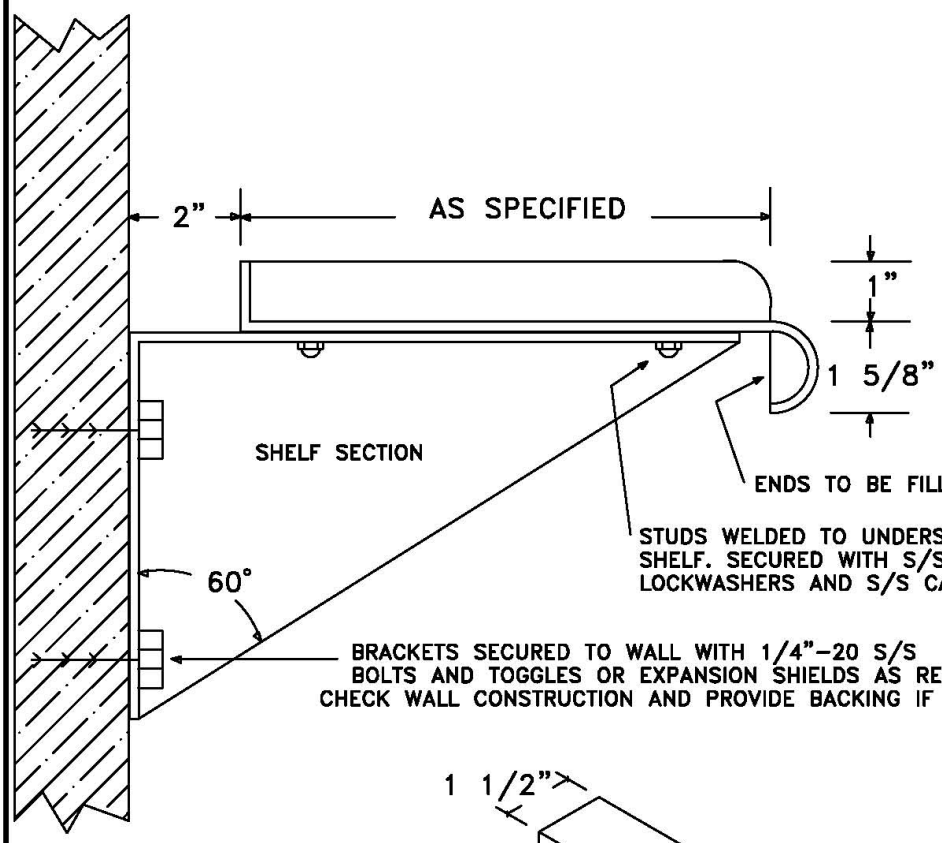
5.1 DETAIL DRAWINGS

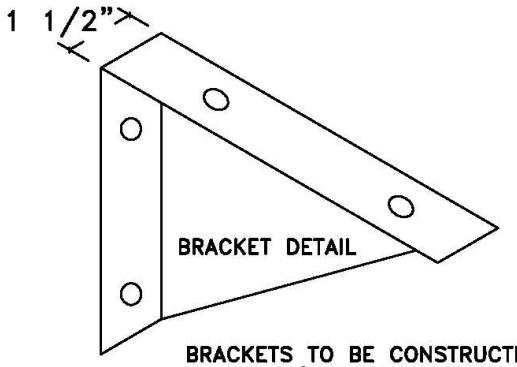
A. The following details are a part of these specifications and shall be referred to for design requirements:

1. 1.0 - Edge Configurations
2. 2.1 - Wall Shelf
3. 3.1 - Leg with Undershelf
4. 3.2 - Leg with Crossbrace
5. 5.0 - Backsplashes
6. 6.1 - Tool Drawer
7. 6.2 - Tool Drawer
8. 7.6 - Pass Through Window and Sill
9. 12.4 - Overshelf with Pot Rack


A
1 5/8"
180°
3"
3/4"
RADIUS
RAISED ROLLED
B
180°
1 5/8"
3/4"
ROLLED
C
1 1/2"
1/2"
45°
180°
1 5/8"
MARINE
D
30°
3/8"
1 3/4"
15°
1/2"
3/4"
INVERTED "V"
Fetech
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Food Service Consultants
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Canastota, New York 13032
EDGE CONFIGURATIONS
DETAIL#1.0

SHELF CONSTRUCTED OF 16 ga. S/S.
ALL JOINTS TO BE WELDED, GROUND AND POLISHED.





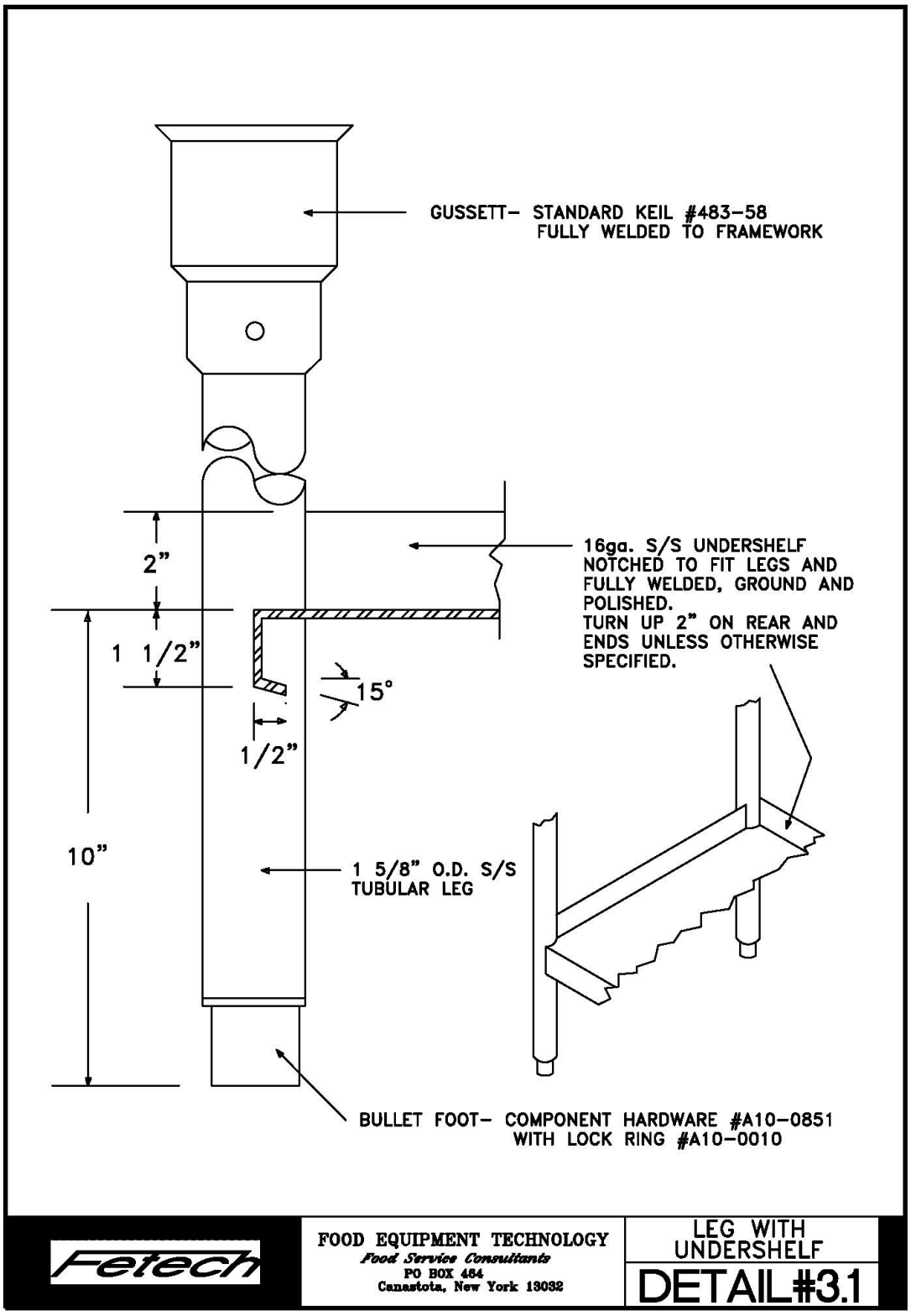
BRACKETS TO BE CONSTRUCTED OF 14 ga. S/S. TWO BRACKETS SUPPLIED WITH SHELVES UP TO 60" LONG. LONGER SHELVES TO HAVE BRACKETS NO MORE THAN 60" ON CENTER.

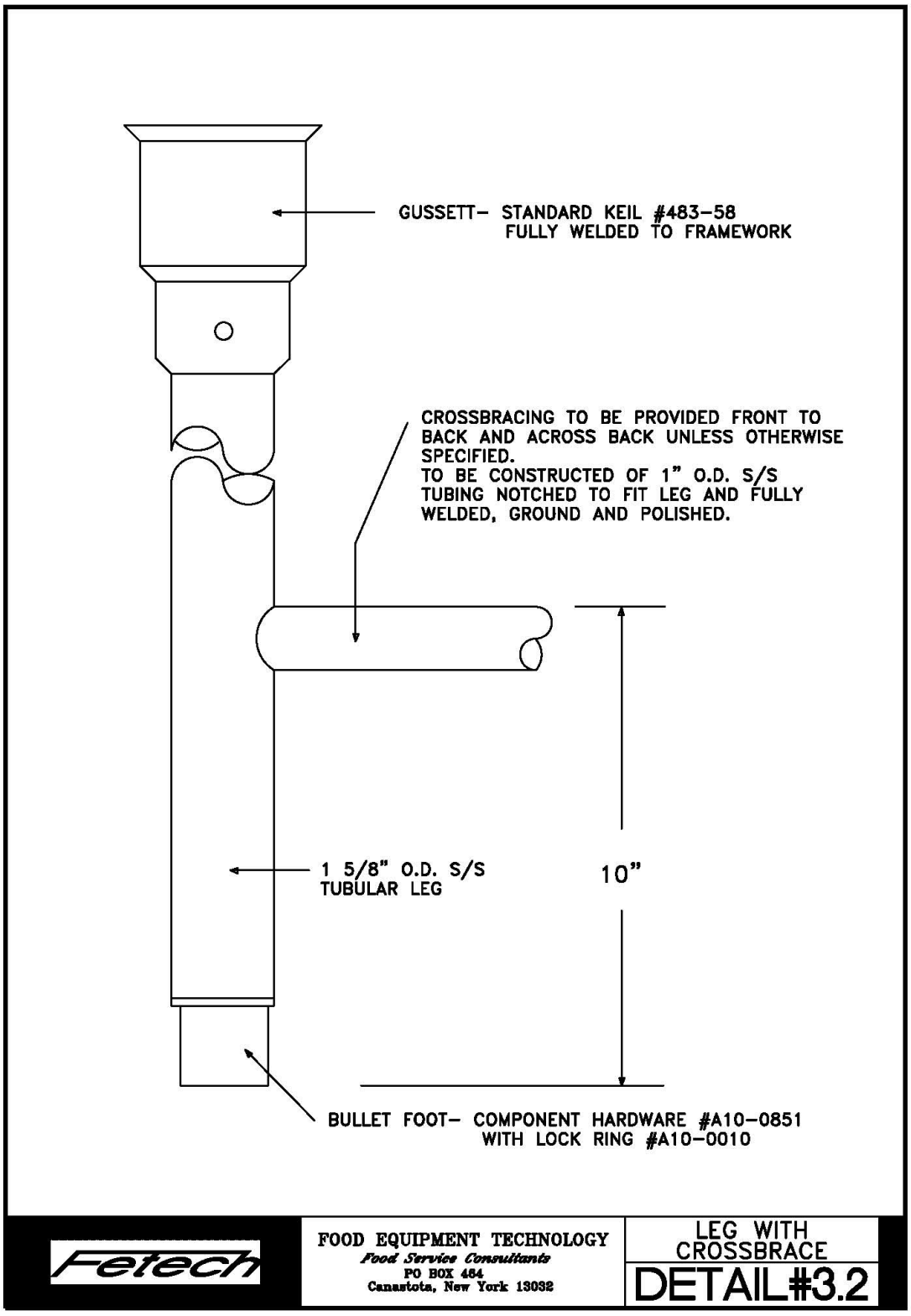
Fetech

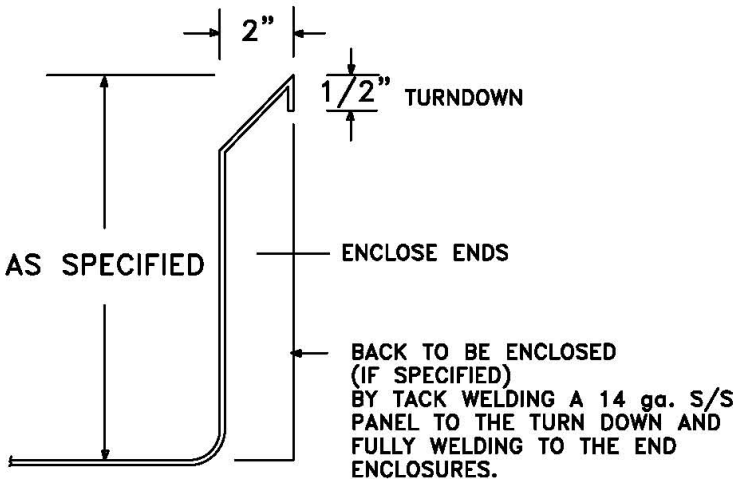
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WALL SHELF AND BRACKET

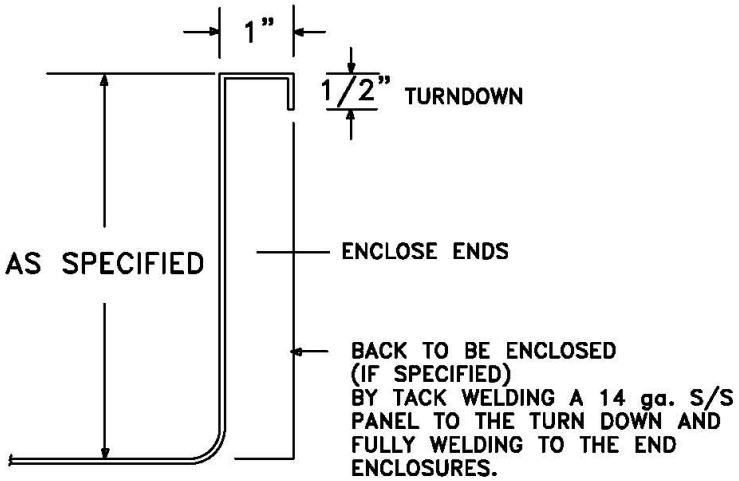
DETAIL#2.1


GUSSETT– STANDARD KEIL #483–58
FULLY WELDED TO FRAMEWORK
16ga. S/S UNDERSHELF
NOTCHED TO FIT LEGS AND
FULLY WELDED, GROUND AND
POLISHED.
TURN UP 2" ON REAR AND
ENDS UNLESS OTHERWISE
SPECIFIED.
2"
1 1/2"
15°
1/2"
10"
1 5/8" O.D. S/S
TUBULAR LEG
BULLET FOOT– COMPONENT HARDWARE #A10–0851
WITH LOCK RING #A10–0010
Fetech
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Food Service Consultants
PO BOX 484
Canastota, New York 13032
LEG WITH
UNDERSHELF
DETAIL#3.1


GUSSETT– STANDARD KEIL #483–58
FULLY WELDED TO FRAMEWORK
CROSSBRACING TO BE PROVIDED FRONT TO BACK AND ACROSS BACK UNLESS OTHERWISE SPECIFIED.
TO BE CONSTRUCTED OF 1" O.D. S/S TUBING NOTCHED TO FIT LEG AND FULLY WELDED, GROUND AND POLISHED.
1 5/8" O.D. S/S
TUBULAR LEG
10"
BULLET FOOT– COMPONENT HARDWARE #A10–0851
WITH LOCK RING #A10–0010
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Canastota, New York 13032
LEG WITH CROSSBRACE
DETAIL#3.2



TYPE "A"



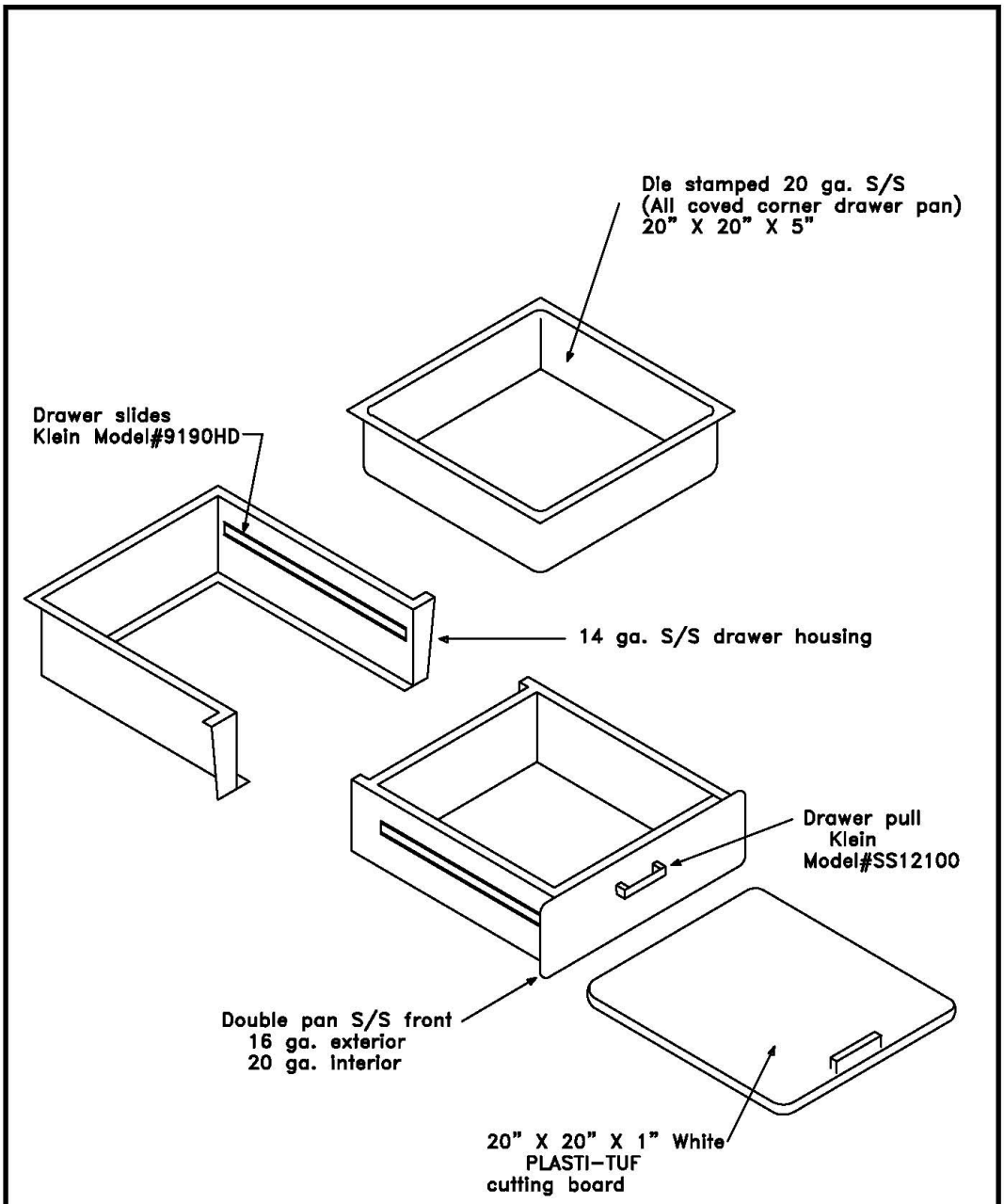
TYPE "B"

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BACKSPLASHES

DETAIL#5.0

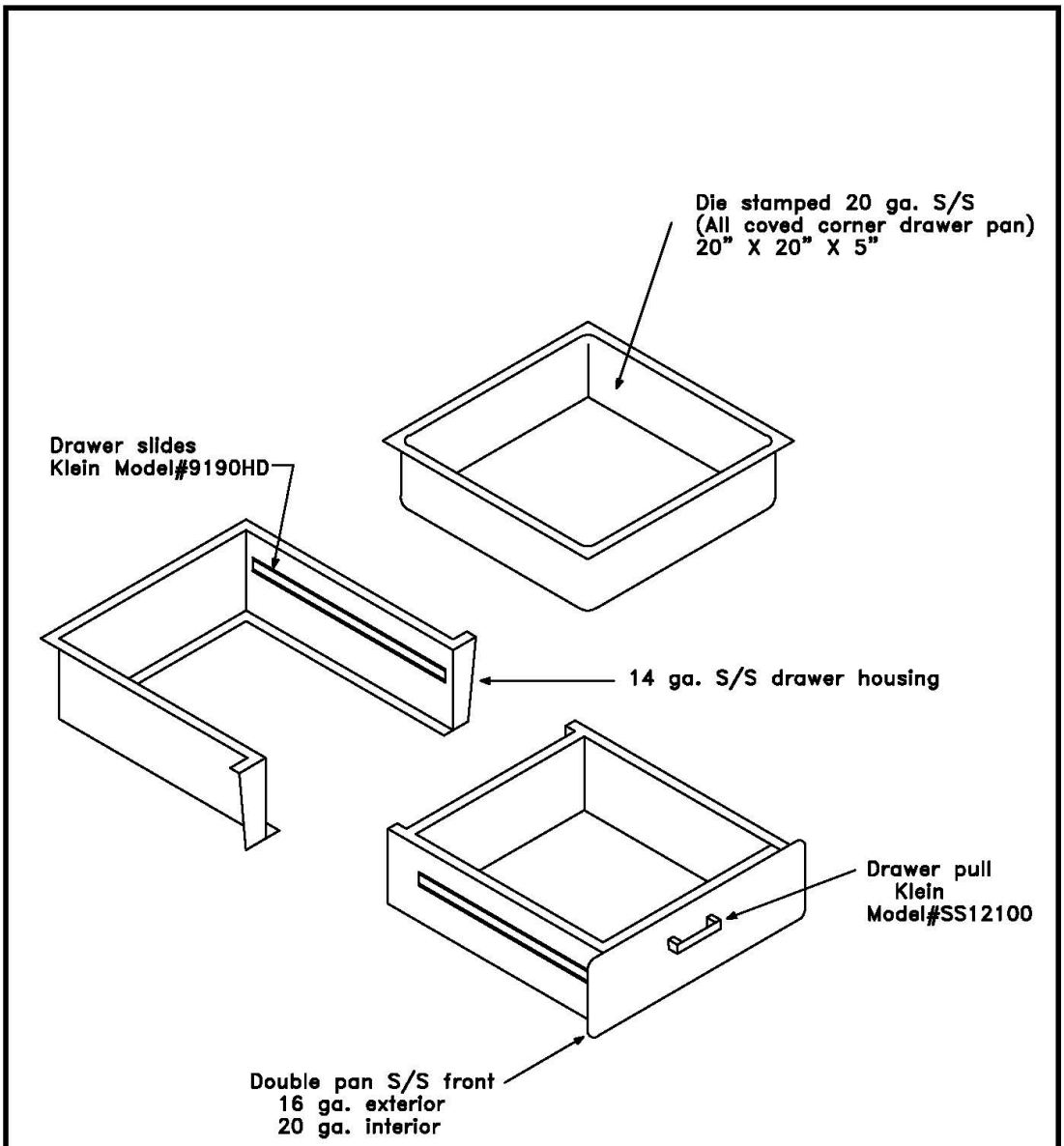


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TOOL DRAWER

DETAIL#6.1

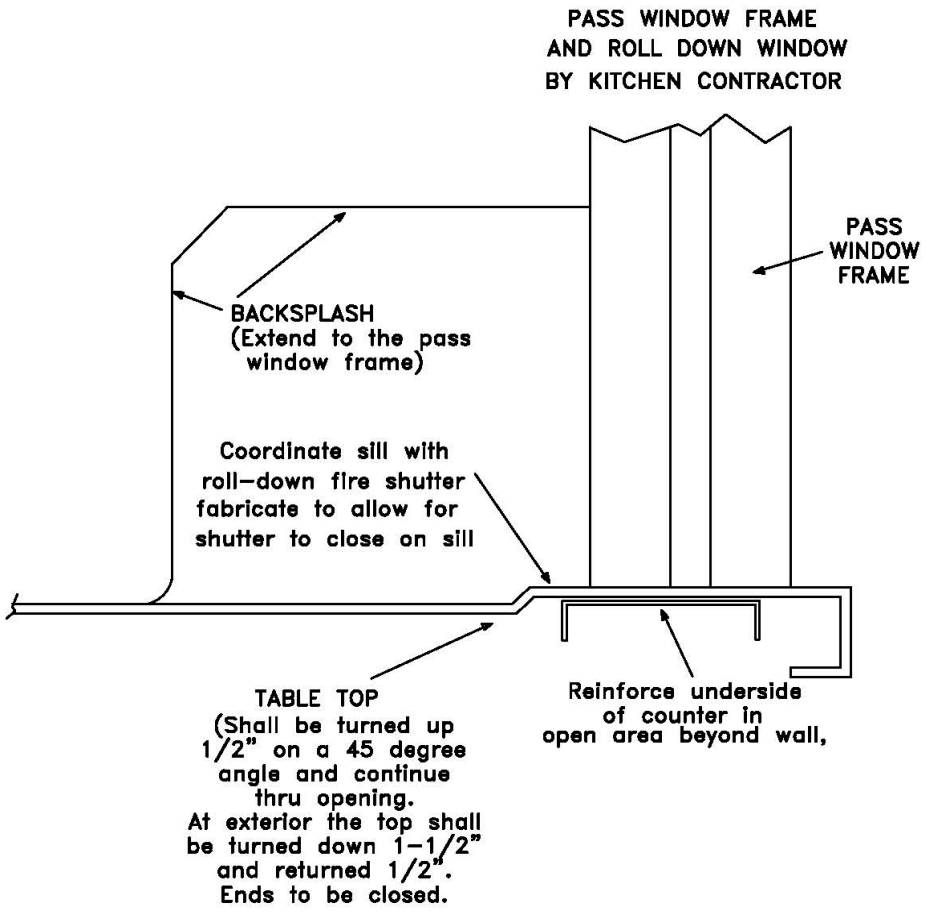


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TOOL DRAWER

DETAIL#6.2

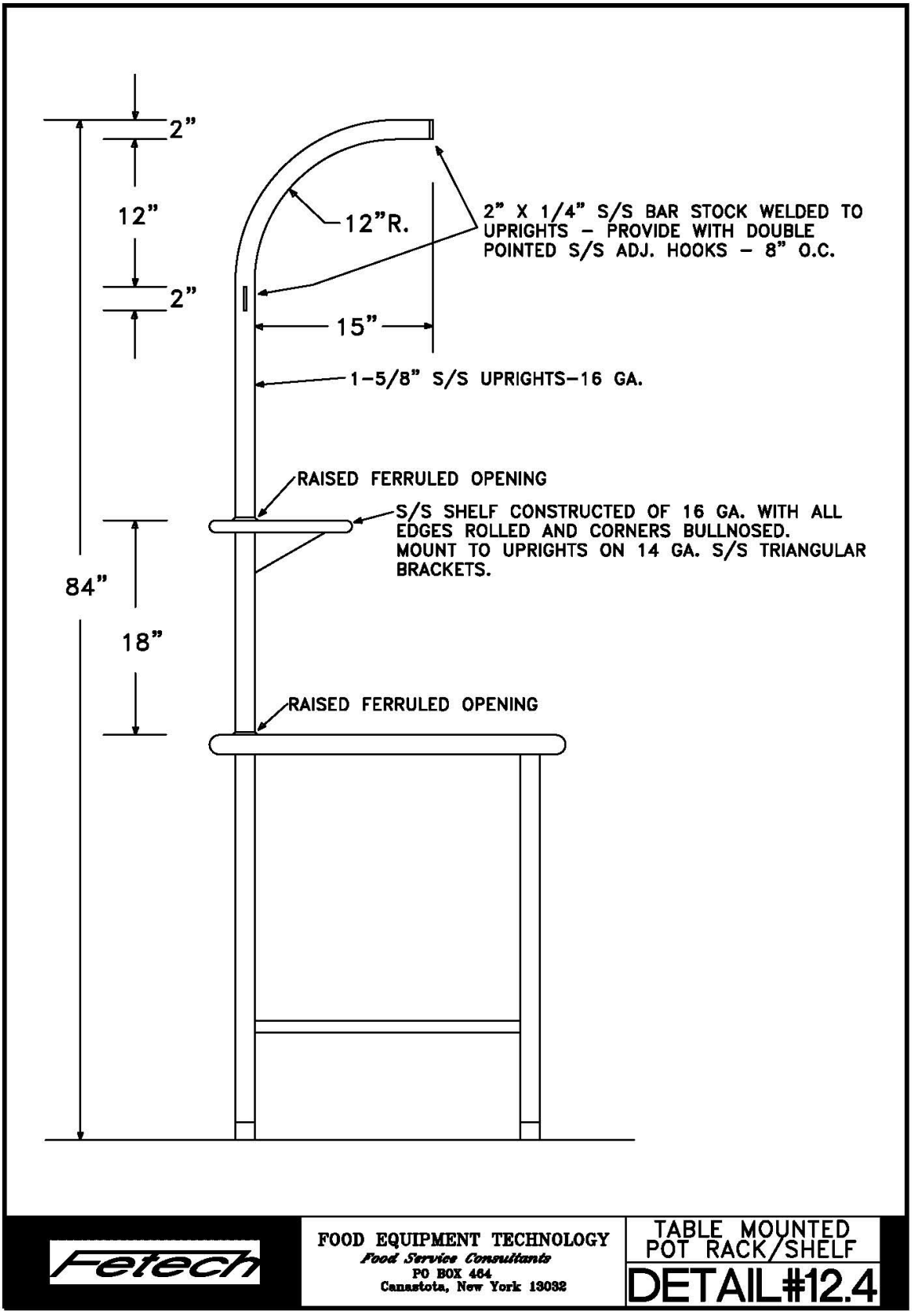


SECTION THRU

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Canastota, New York 13032

PASS
WINDOW
DETAIL#7.6


2"
12"
2"
84"
18"
12"R.
2" X 1/4" S/S BAR STOCK WELDED TO UPRIGHTS – PROVIDE WITH DOUBLE POINTED S/S ADJ. HOOKS – 8" O.C.
15"
1-5/8" S/S UPRIGHTS-16 GA.
RAISED FERRULED OPENING
S/S SHELF CONSTRUCTED OF 16 GA. WITH ALL EDGES ROLLED AND CORNERS BULLNOSED. MOUNT TO UPRIGHTS ON 14 GA. S/S TRIANGULAR BRACKETS.
RAISED FERRULED OPENING
Fetech
FOOD EQUIPMENT TECHNOLOGY
Food Service Consultants
PO BOX 464
Canastota, New York 13032
TABLE MOUNTED POT RACK/SHELF
DETAIL#12.4

END OF SECTION 114000

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.
2. Roller shade fabrics.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations, all dimensions, and clearances for each shade installation.

1. Include typical elevation layout showing separation between shade units and meeting edges at corners with sections and details at head and sill between blind units and corners.
2. Provide verified in field details showing all types of shade installation conditions.
3. Components and conditions not fully dimensioned or detailed in manufacturers product data indicating relationship to adjoining construction.
4. Manufactures specification instructions and details specific to components and conditions not fully dimensioned or detailed in manufactures product data.
5. Provide data for all components required for installation.

C. Samples for Verification and Initial Color Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.
2. Actual color samples of manufactures full range – no color copies will be accepted.
3. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
4. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
5. Installation Accessories: Full-size unit, not less than 10 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of shadeband material, signed by product manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.
B. Warranty: Each product warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 WARRANTY

A. Manufacturer's Warranty - Provide manufacturer's warranty including coverage of at least following components:

1. Corrosion of all metal parts.
2. Sagging, creasing, or breaking of slats.
3. Sagging, creasing, or ripping of shadeband material.
4. Smoothly performing mechanism without slippage or jams.
5. Finish of all components matching in color, uniform, and against fading or discoloration.
6. Defects in materials and installation workmanship.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Draper Inc.; Manual FlexShade Systems or comparable product by one of the following:

1. Hunter Douglas Contract.
2. MechoShade Systems, Inc.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated; with chain retainer.

1. Bead Chains: Manufacturer's standard.

a. Limit Stops: Provide upper and lower ball stops.

b. Tension hold Down Device – to comply with Child Safety Standard ANSI/WCMA- this product must contain and be installed with the required clutch operated hold down device at all locations.

c. Hold Down Devices – provide sill, side wall or extender types- verify in field types required.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Direction of Shadeband Roll: Regular, from back of roller and or back to front to clear window handles, extrusions etc.

2. Shadeband-to-Roller Attachment: Manufacturer's standard method- no double-side tape will be accepted. Provide adequate brackets on multiple sash windows to hold roller pin ends no more than 1/8 inch apart over centerline of mullion.

D. Shadebands:

1. Shadeband Material: Light-filtering fabric similar to “Sheer-weave Series 2400/2500” fabric by Draper Inc.
2. Shadeband Material: Light-blocking fabric similar to “Sun-Bloc Series” fabric by Draper Inc.

E. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

1. Type: Enclosed in sealed pocket of shadeband material.

F. Fabrication:

1. Cut shades perfectly square and true and mount on rollers using suitable fasteners. Provide all material used in shade manufacture new, commercially perfect and of first quality. Provide material in one piece.

2. Provide one finished length of each single hung shade after hemming 14 inches longer than portion of sash covered by shade. Provide finished shade width to cover adequately, but not more than 1/4 inch of barrel exposed at each end of roller.

    a. Where necessary, increase diameter of roller from 1-1/4 inches to correspond with size of shade.
    b. Provide hems of proper width for slat, double turn hems, and sew with straight stitch. Neatly backstitch all hems at the ends.
    c. Hem at top and bottom of shade.

3. Fabrication Tolerances:

    a. Size shades to fit openings head – including but not limited to wall, door, window head etc., to sill including but not limited to windowsill, floor sill etc. (allowing for 6 to 10 inches in additional length) and between mullions, unless otherwise indicated on Drawings.

    b. Provide single sets of shades no greater in width than distance between 2 mullions at openings up to 15 ft. wide.

    c. Provide minimum clearances for appropriate operation of shades.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

    a. Shape: L-shaped.
    b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open.
    c. Provide full range of manufactures colors.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open.
   b. Provide full range of manufactures colors.

3. Endcap Covers: To cover exposed endcaps.

4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open.

5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric (Same Color Both Sides): Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.

2. Type: Woven polyester and PVC-coated polyester.

3. Weave: Basketweave.

4. Color: As selected by Architect from manufacturer's full range.

5. Basis-of-Design Product: Subject to compliance with requirements, provide the following Draper Inc. product or comparable product:

   a. Light-Filtering Fabric (Same Color Both Sides) Openness Factor 3 percent: SheerWeave Series.

      1) Thickness: 0.037 inches.
      2) Weight: 20.7 oz./sq. yd.
      3) Locations: East-, west- and south-facing windows with clear view.

C. Light-Filtering Fabric (Different Color Each Side): Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.

2. Type: PVC-coated fiberglass.

3. Weave: Basketweave.

4. Color: As selected by Architect from manufacturer's full range.

5. Basis-of-Design Product: Subject to compliance with requirements, provide the following Draper Inc. product or comparable product:

   a. Light-Filtering Fabric (Different Color Each Side) Openness Factor 3 percent: SheerWeave Series SW2703.

      1) Thickness: 0.028 inches.
      2) Weight: 14.0 oz./sq. yd.
      3) Locations: East-, west- and south-facing windows with clear view.

   b. Light-Filtering Fabric (Different Color Each Side) Openness Factor 5 percent: SheerWeave Series SW2705.

      1) Thickness: 0.03625 inches.
      2) Weight: 11.8 oz./sq. yd.
      3) Locations: North-facing windows with clear view; east-, west- and south-facing windows with obstructed view.

D. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Type: Fiberglass textile with PVC film bonded to both sides.
3. Thickness: 0.015 inches.
4. Weight: 12 oz./sq. yd.
5. Features: Washable.
6. Color: As selected by Architect from manufacturer's full range.
7. Basis-of-Design Product: Subject to compliance with requirements, provide Draper Inc.; SunBloc Series SB9000 or comparable product.

E. Rescue Window Labels: Provide and install on window shade in every space of pupil occupancy opaque labels with words "RESCUE WINDOW" Install labels on shades associated with rescue window coordinate with Architect for location.

1. Color: Opaque, bright yellow background with black letters.
2. Size: 2 inches by 1 inch, 3/8” wide lines to form letters.
3. Text: “RESCUE WINDOW”, readable from room side of window.

2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Tension hold Down Device – to comply with Child Safety Standard ANSI/WCMA- this product must contain and be installed with the required clutch operated hold down device at all locations.

C. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible.

E. Rescue Window Labels: Provide and install on window shade in every space of pupil occupancy opaque labels with words "RESCUE WINDOW" Install labels on shades associated with rescue window coordinate with Architect for location.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

2. Hang shades at window to fit opening properly and operate smoothly and efficiently. Hang each shade perfectly level and with spring tension of roller properly adjusted. Locate tips of adjoining shades no further than 3/8 inch apart when two or more are mounted back-to-back.

3. Install each shade on brackets securely fastened to ceiling or wall as shown on Drawings. Furnish and install new brackets and other hardware required for proper installation of shades.

B. Prior to installation of roller-shade units, coordinate installation locations and method of installation with window manufacturer, do not secure roller-shade units to window frame.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12 24 13

SECTION 12 32 16 - MANUFACTURED PLASTIC-LAMINATE-FACED CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plastic-laminate-faced cabinets of stock design.

B. Section Includes

1. Plastic laminate faced casework - overlay door design, including (but not limited to):

    a. Wall, base and tall cabinets

2. Accessory items, including:

    a. All filler panels, frame units, scribe strips, strips at walls, and similar items.
    b. Cutouts for sinks, faucets, fittings, and other plumbing and electrical fixtures, electrical and mechanical runs and connections and similar items.
    c. Epoxy resin countertops and sinks, drains and tail pieces
    d. Materials and devices necessary to make solid connections to existing structure

C. Products Furnished but not Installed Under this Section

1. Mechanical components, electrical components, plumbing components and similar items included with specified casework items; refer to "Sequencing and Scheduling".

1.3 DEFINITIONS

A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.

B. MDF: Medium-density fiberboard.

C. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

1.5 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Casework.
2. Hinges.
3. Pulls.
4. Door catches.
5. Drawer slides.
6. Label holders.
7. Drawer and hinged door locks.
8. Adjustable shelf supports.
9. Wardrobe rod.
10. Coat hooks.
11. Closet rod and shelf.
12. Grilles.
13. Window Stools

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show fabrication details, including types and locations of hardware. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.

1. Roughing Drawings: Submit roughing drawings, showing complete roughing dimensions for plumbing, ventilating and electric services and components to be installed in casework, including location of existing roughing and dimensions, where applicable.

2. Groups/Assemblies: Submit shop drawings of groups or assemblies, including descriptions identifying units, parts, and accessories of each item and showing materials, dimensions, cabinet-cut details, and sink locations (where applicable).

3. Field Measurements: Prior to fabrication or ordering of any specified casework items, verify measurement at Site of actual space reserved for casework items; DO NOT take measurements from Contract Drawings. Give due consideration to architectural, structural, or mechanical discrepancies occurring during building construction. Make such discrepancies immediately known to Architect and obtain clarification of discrepancy in writing before proceeding with installation of affected casework items.

4. Color/Finishes: Shop drawings are not to include colors, wood finishes, stains, etc. All colors are to be selected by the Architect and issued to the contractor by an ASI during the construction phase.

C. Samples:

1. Casework Units: Without cost to Owner, submit representative samples, as requested, to demonstrate Contractor's ability to furnish required casework.
2. Color Selection: Submit actual samples of finishes, colors, and materials as required for color selection. Submit full range of manufacture colors.

D. Mock-Ups (To be included in pricing when indicated/requested in bid documents): Submit following units for comparison with items installed as part of casework installation. Mock-up units must be submitted prior to or with casework submittal. When requested, casework submittals and shop drawings will not be approved without mock-up units.

1. One full-size base cabinet unit complete with hardware, doors, and drawers; without finish top.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1. Joint Tolerances 400C-T-1.
2. Finishes Test 400C-T-2.

C. Sample Warranty: For special warranty.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5-years' experience in manufacture of casework and other items similar to those specified and minimum 5 completed casework installations of similar size and requirements to that specified.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project and a certified participant in AWI's Quality Certification Program (QCP).

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period. Maintain temperature and relative humidity during the remainder of the construction period in range recommended for Project location by the AWI's, "Architectural Woodwork Standards."

B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.11 SEQUENCING AND SCHEDULING

A. Coordinate the layout and installation of casework with all Prime Contractors. See Section 01 10 00 / 01 12 00 for each Contractor’s coordination responsibilities.

B. Provide all holes / cut outs in the casework for all Prime Contractors on the Project. Coordinate with the work on the E, P, & HVAC drawings and Division 22, 23, 26, and 28.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Delamination of components or other failures of glue bond.
   b. Warping of components.
   c. Failure of operating hardware.

2. Contractor's Guarantee: Upon completion of installation of casework and after acceptance by Owner, furnish to Owner written statement accepting full responsibility for installation and guaranteeing adequacy and safety of attachment of all casework.

3. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, drawings and specifications are based on products manufactured by TMI SYSTEMS CORPORATION, 50 South Third Avenue West, Dickinson, ND or comparable product by one of the following:

1. TMI Systems Corporation.
2. Case Systems Inc.
3. Other manufacturers shall comply with the minimum levels of material and quality as indicated on the drawings or as specified.

C. Source Limitations: Obtain laminate clad items including casework, countertops, and architectural woodwork from the same casework supplier to establish single responsibility for all laminated and related components.

2.2 CASEWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: Premium
2. Provide labels and certificates from AWI certification program indicating that casework, including installation, complies with requirements of grades specified.

B. Product Designations: Drawings indicate sizes, configurations, and finish materials of manufactured laminate clad casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish materials, and complying with the Specifications may be considered. See Section 01 60 00 "Product Requirements."

C. Product Designations: Drawings indicate configurations of manufactured laminate clad casework by referencing designations of Casework Design Series (CDS) numbering system in the “Design Ideas” Section of the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

D. Minimum Component Flammability Requirements: Provide casework with components meeting the following requirements to achieve minimum of “Class C” rating per ASTM E84:

		Flame Spread Index	Smoke Developed Index
1.	Exterior High Pressure Laminate:	76-200	0-450
2.	High Pressure Laminate Exterior Bonded to High Performance Particleboard Core Material:	76-200	0-450

2.3 PLASTIC LAMINATE-FACED CABINETS

A. Design:

1. Reveal overlay.

B. Exposed Casework Surfaces:

1. Plastic Laminate: Grade VGS (0.028" Thickness)

a. Colors and Patterns: As selected by Architect from manufacturer's full range
b. For exterior cabinet surfaces, interior of open cabinets, and interior of glass door cabinets.
c. Unless otherwise indicated, provide specified edgebanding on all exposed edges.

C. Semi-exposed Casework Surfaces:

1. Thermoset Decorative Panels: Provide WHITE thermoset decorative panels for semi-exposed surfaces unless otherwise indicated.

a. Melamine resin impregnated TFM, surface thermally-fused to core under heat and pressure, meeting NEMA LD3-2005 standards.
b. Unless otherwise indicated, provide specified edgebanding on all semi-exposed edges.

D. Balanced Construction of all laminated casework panels is mandatory.

1. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
2. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), will not be permitted.

2.4 MATERIALS

A. Particleboard: Industrial Grade average 45-pound density, meeting ANSI A208.1, Grade M-2 requirements.

B. MDF: Average 48-pound density, meeting ANSI A208.2, Grade 130 requirements.

C. Hardboard: ANSI A135.4, Class 1 Tempered.

D. Moisture Resistant (MR) Particleboard: For all countertop applications. Industrial Grade average 45-pound density, meeting ANSI A208.1, Grade M-2 requirements.

E. Glass for Glazed Doors: Clear laminated safety glass; not less than 1/4 inch thickness.

F. Frameless Glass Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than [**5.0 mm**] [**6.0 mm**] thick; with exposed edges seamed before tempering.

G. Laminate Manufacturers: Up to 5 different colors (1 color per unit face) as selected by Architect from manufacturer's full range of standard (non-premium) color and finish options including patterns, solid colors, and woodgrain laminates from each manufacturer listed below:

1. Wilsonart International.
2. Formica.
3. Panolam (Nevamar & Pionite).

H. Countertop High Pressure Plastic Laminate: Grade HGS/HGP (0.039" Thickness)

1. Colors and Patterns: As selected by Architect from manufacturer's full range

I. Countertop Solid surface material:

1. Refer to Specification Section 12 36 61.16 "Solid Surfacing Countertop".

J. Solid Surface window sills and aprons:

1. Solid-Surfacing Material Thickness: 1/2-inch.

2. Fabrication: Fabricate stools and aprons in one piece, unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing

3. Adhesives: Adhesives shall not contain urea formaldehyde.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Corian
   b. Formica Corporation.
   c. Wilsonart International.
   d. Hanex Solid Surfaces.

5. Colors and Patterns: As selected by Architect from manufacturer's full range.

K. Edge Banding for Plastic Laminate

1. 0.020mm PVC: Solid, high impact, purified, color-thru, acid resistant PVC edging machine-applied with hot melt adhesives, automatically trimmed face, back and corners for uniform appearance.

2. 3mm PVC: Solid, high impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design.

3. Flexible 3mm PVC: Flexible, solid, high impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design.

L. Edging Locations

1. Door and Drawer Face Edges, Cabinet Body Front Edges and Front Edges of Interior Components (including Shelves) of Open Cabinets, Cubbies and Mailbox units, and Support Panel Exposed Edges: 3mm PVC selected from minimum 200 colors including solid, pattern, and woodgrains.

2. Cabinet Body Edge and Front Edges of Interior Components of Casework with Doors/Drawers: 0.020mm PVC selected from minimum 200 colors including solid, pattern, and woodgrains.

    a. Color to match Exterior Surfaces on fixed components including vertical dividers, and drawer dividers.
    b. Color to match Interior Surfaces (WHITE) on adjustable components including shelves.

3. Countertops & Laminated Window Sills: 3mm PVC selected from minimum 200 colors including solid, pattern, and woodgrains.

    a. Countertop – 3mm PVC edge banding.
    b. Countertop - Plastic laminate self edge.
    c. Window Sill – 3mm PVC edge banding.
    d. Window Sill - Plastic laminate self edge.

4. Edgebanding for Thermoset Decorative Panels: PVC edgebanding matching thermoset decorative panels.

2.5 FABRICATION

A. Plastic Laminate Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:

1. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: Minimum 3/4-inch (19-mm) thick particleboard, doweled together utilizing minimum 10mm hardwood, fluted dowels.

2. Fixed Cabinet Interior Components: Minimum 3/4-inch (19-mm) thick particleboard, doweled to Casework body utilizing minimum 10mm hardwood, fluted dowels.

3. Shelves: Minimum 3/4-inch (19-mm) thick particleboard for shelves up to 30” wide. Minimum 1-inch (25-mm) thick particleboard for shelves over 30” wide.

4. Backs of Cabinets: Minimum 1/4-inch (6-mm) thick particleboard or MDF, fully captured (dadoed) by cabinet sides, bottoms, and tops. Finish to match interiors.

5. Exposed Backs of Cabinets: Minimum 3/4-inch (19-mm) thick particleboard, doweled to the sides of the cabinet, with exposed surface of Grade VGS (0.028” Thickness) laminate.

6. Door and Drawer Fronts: Minimum 3/4-inch (19-mm) thick particleboard.

7. Drawer Sides, Backs and Sub-Front: Minimum 1/2-inch (12-mm) particleboard, doweled together utilizing minimum 8mm hardwood, fluted dowels.

8. Drawer Bottoms: Minimum 1/2-inch (12-mm) particleboard, screwed directly to the bottom edges of the drawer box.

B. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

2.6 CASEWORK HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

B. Hinges: Epoxy powder coated, five-knuckle hinges, institutional grade, 2-3/4 inch overlay type with hospital safety tip, of 0.095 inch thick metal, complying with BHMA A156.9, Grade 1 requirements. Available in color options including gray, beige, white, black and chrome. Provide two hinges for doors less than 48 inches (1220 mm) high, and provide three hinges for doors more than 48 inches (1220 mm) high.

C. Pulls: Pull design to be selected by Architect from TMI Vendor Stock Pull Program or similar pre-approved program. Selection to include minimum of 20 design and finish options including: Bar Pull, Bow Pull, Contemporary Pull, Heavy Bow Pull, Petite Bow Pull, and Wire Pull. All pull designs to be of full metal construction, with 96mm hole spacing, meeting requirements of the ADA law.

D. Door Catches: Zinc-plated Powder-coated, nylon-roller spring catch or dual, self-aligning, permanent magnet catch. Provide two catches on doors more than 48 inches (1220 mm) high.

E. Drawer Slides: BHMA A156.9, Type B05091.

1. Standard Drawers: Side mounted and extending under bottom edge of drawer, epoxy-coated steel with polymer rollers. 100-lb load rating with positive stop in both directions, and self-closing feature.

2. File Drawers and Paper Storage Drawers: Full-Extension Side mounted and extending under bottom edge of drawer, epoxy-coated steel with polymer rollers. 150-lb load rating with positive stop in both directions, and self-closing feature

F. Label Holders: Chrome plated, sized to receive standard label cards, attached with screws or brads. Provide label holders on all mail box units and as shown on drawings.

G. Drawer and Hinged Door Locks: Cylindrical (cam) type, five-pin tumbler, brass with chrome-plated finish, and complying with BHMA E07261/62/63, Grade 1. Each room is to be keyed and master keyed.

1. Provide a minimum of two keys per lock and six master keys.
2. Provide locks on all doors and drawers.

H. Adjustable Shelf Supports: Two-pin, self-locking for 3/4-inch and 1-inch shelves, polycarbonate shelf clips complying with BHMA A156.9, Type B04013. Adjustable in 32-mm line boring holes. Load rating of a minimum of 300 lbs. each support without failure

I. Adjustable Wall Shelf Supports: Surface-type steel standards and steel shelf brackets, with epoxy powder-coated finish, complying with BHMA A156.9, Types B04102 and B04112.

J. Countertop Support: type and style as called out on drawings.

K. Wardrobe Rod: 1-inch diameter, 14-gauge chrome plated steel, supported by captive mounting flanges.

L. Coat Hooks:

1. Single coat hooks, wall mount - Satin Aluminum.
2. Double coat hooks, wall mount - Satin Aluminum.

M. Closet Rod and Shelf:

1. Wall mount rod brackets - 1-inch diameter, 14-gauge chrome plated steel, supported by captive mounting flanges.
2. Wood rod and plastic laminate shelf above.
3. Length as shown on Drawings.

N. Grilles: Continuous brushed aluminum finished countertop grille and toe-kick grille for air filtration at fin tube locations and as shown on Drawings similar to “Model #CT-PP-3 (countertop) / #CT-PP-0 (toe) Linear Diffuser” by Titus.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 COMPONENTS

A. Cabinet Construction:

1. Sub-Base: Fixed base and tall cabinets to have individual, factory assembled and attached sub-base of minimum 3/4-inch (19-mm) thick plywood. (No cabinet body sides-to-floor allowed.) Sub-base is 4-inches high unless otherwise indicated.

2. Cabinet Top and Bottom: Solid, full depth sub-top furnished for all base and tall cabinets (except sink base cabinets). Cabinets with front and back rails or partial depth sub-tops will not be accepted.

   a. Wall Cabinet Bottoms and Tops: 3/4 inch thick particleboard.

   b. Exterior Exposed Wall Cabinet Bottoms: Melamine resin impregnated TFM, surface thermally-fused to core on both sides. Assembly devices concealed on bottom side of wall cabinets.

3. Line Boring for Adjustable Shelves: Side panels and fixed vertical dividers shall receive line boring holes spaced 1-1/4 inches (32-mm) apart, running full height of each component. Line boring holes shall interact with adjustable shelf clips. Exposed exterior cabinet ends laminated with high pressure plastic laminate and balanced with high pressure cabinet liner (Grade CLS of 0.020" Thickness) on interior surface.

4. Cabinet Backs: Minimum 1/4-inch (6-mm) thick particleboard or MDF, fully captured (dadoed) by cabinet sides, bottoms, and tops. Finish to match interiors. With 3/4-inch x 4-inch particleboard rails placed behind the back panel at the top and bottom, and doweled to the cabinet sides. A third intermediate rail to be included on all cabinets over 56 inches tall. Utilize hot melt glue to further secure the back panel and increase overall structural strength. Use of staples to secure backs not acceptable.

   a. Exposed Backs of Cabinets: Minimum 3/4-inch (19-mm) thick particleboard, doweled to the sides of the cabinet, with exposed surface of Grade VGS (0.028" Thickness) laminate. Exposed particleboard backs not acceptable.

B. Door and Drawer Fronts:

1. Laminated Door and Drawer Fronts: Minimum 3/4 inch thick. Drawer fronts and hinged doors overlay cabinet body. Maintain maximum 1/8-inch reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within cabinet.

C. Drawers

1. Drawer Fronts: Applied to separate drawer body component sub-front.

2. Drawer Sides: Doweled together utilizing minimum 8mm hardwood, fluted dowels. Stapled fastening not acceptable.

3. Drawer Bottoms: Minimum 1/2-inch (12-mm) particleboard, screwed directly to the bottom edges of the drawer box. Bottom fully supported by drawer glides running front-to-back.

4. Suspension (all drawers): Drawer Slides as specified above in "CASEWORK HARDWARE AND ACCESSORIES".

D. Adjustable Vertical and Horizontal Dividers:

1. Hardboard: Natural MDF hardboard 1/4 inches thick, smooth both faces, finished to match interior. Secured in cabinet with molded plastic clips.

2. Fused Laminate: Melamine resin impregnated TFM, surface thermally-fused to core on both sides, 3/4-inch thickness. Secured in cabinet with Adjustable Shelf Supports as specified above in "CASEWORK HARDWARE AND ACCESSORIES".

E. Door/Drawer Front Rail: Provide minimum 3/4-inch x 6 inches x full width cabinet body rails immediately behind all door/drawer and multiple drawer horizontal joints.

F. ADA-Americans with Disabilities Act Requirements: Comply with following special requirements, where specifically indicated on Drawings as "ADA" or “H.C.”

1. Countertop Height: With or without cabinet below, not to exceed a height of 34 inches above finished floor, at surface depth of 24 inches.

2. Kneespace Clearance: Minimum 27 inches above finish floor and 30 inches clear span width.

4. Adjustable or Fixed 12 inches Deep Shelving: not exceeding 9 inches to 54 inches above finish floor.

5. Wardrobe Cabinets: Furnished with rod/shelf adjustable to 48 inches above finish floor at maximum 21 inches shelf depth.

6. Sink Cabinet Clearances: In addition to "Kneespace Clearance" above, upper kneespace frontal depth not less than 8 inches, and lower toe frontal depth not less than 11 inches, at point 9 inches above finish floor, provide outlet in back corner of sink bowl. Coordinate with Plumbing drawings and as further described in ADAAG guidelines.

G. Countertops: Minimum 1-1/8 inch thickness unless otherwise shown on drawings, with minimum 4 inches high backsplash. Underside properly balanced with heavy gauge backing sheet. Furnished with edge treatment and design profile as shown on Drawings; built-up edges not acceptable. Provide tops in as long as practical continuous lengths. When seams are necessary, laminate pattern match is required. Provide field glued splines at joints. No joints closer than 24 inches either side of sink cutout.

H. Window Sills: 1-1/8 inch thickness unless otherwise shown on drawings and details, refer to 1/8” and 1/4” scale drawings for locations. Underside properly balanced with heavy gauge backing sheet. Furnished with edge treatment and design profile as shown on drawings and details; Provide tops in as long as practical continuous lengths 8’ min. When seams are necessary, laminate pattern match is required. Provide field glued splines at joints.

I. Fabrication:

1. High-pressure laminate provided on all exposed exterior cabinet surfaces. Laminate surface/ balancing liner applied to core under controlled conditions, by approved and regulated laminating methods for premium lamination. Methods requiring heat and spray-on "contact adhesive" methods of laminating not acceptable.

2. Cabinet parts accurately machined and bored for “premium grade” quality joinery construction utilizing automatic machinery to insure consistent sizing of modular components. End panels doweled to receive bottom and top.

3. Back panel fully secured to or recessed 7/8 inch from back of cabinet sides, top, and bottom ensuring rigidity and fully closed cabinet. Cabinet back shimmed from rear of body for tight interior fit. Staple attachment of back panel not acceptable.

4. All cases fabricated square, plumb, and true.

5. Removable back panels and closure panels provided for access where shown on Drawings or as required for HVAC units.

6. Grilles: Install continuous grilles in locations at unit ventilator countertops and bases and as noted on Drawings.

3.3 CASEWORK INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Install casework 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.

C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust sub-tops within 1/16 inch (1.5 mm) of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch (1.5 mm). Bolt adjacent cabinets together with joints flush, tight, and uniform.

D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch (1.5 mm) of a single plane. Fasten to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch (1.5 mm).

E. Fasten cabinets to adjacent cabinets and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards".

F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

G. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.4 CLEANING

A. Repair or remove and replace defective work as directed on completion of installation.
B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 12 32 16

SECTION 12 36 61.16 – SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-surface-material countertops and splashes.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Countertop materials.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.4: For adhesives, documentation indicating that product contains no urea formaldehyde.

2. Laboratory Test Reports for Credit IEQ 4: For adhesives, documentation indicating that products 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. Shop Drawings: For countertops. Show materials, finishes, edge and splash profiles, methods of joining, and cutouts for plumbing fixtures.

D. Samples for Initial Selection: For each type of material exposed to view.

E. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.

F. Warranty: Sample of special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid-surfacing countertops to include in maintenance manuals.
B. Warranty: Executed special warranty specified in this Section.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.7 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or splashes.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace solid-surfacing countertops that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: 1-inch laminated bullnose.
2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.

B. Countertops: 1/2-inch with front edge built up with same material.

C. Splashes: 1/2-inch thick, solid surface material.

D. Fabrication: Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose splashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

2.2 COUNTERTOP MATERIALS

A. Adhesives: Adhesives shall not contain urea formaldehyde.

B. Adhesives: Adhesives 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. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1, Class A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Corian
b. Formica Corporation.
c. Wilsonart International.

2. Colors and Patterns: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installing solid-surfacing countertops, examine shop-fabricated work for completion and complete work as required.
B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install splashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

END OF SECTION 12 36 61.16

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Definitions, references, and abbreviations.
2. General regulatory requirements.
3. General requirements regarding site/field conditions including existing conditions and field measurements.
4. Sequencing and scheduling including coordination.
5. Definition of design equipment and procedures for consideration of specified equivalents, proposed equivalents, or substitutions.
6. Plumbing requirements for foodservice equipment.
7. Transition fittings.
8. Grout.
9. Plumbing demolition.
10. Equipment installation requirements common to equipment sections.
11. Painting and finishing.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

C. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

F. 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.

G. Potable Water Outlets: Includes external outlets (hose bibs) and any internal outlets that may be used for drinking or cooking (including food preparation) or potentially used for drinking or cooking. Outlets include:

1. Bubblers/drinking fountains/water coolers/bottle fillers.
2. Classroom sinks.
3. Classroom combination sinks and bubblers.
4. Kitchen sinks.
5. Kitchen kettle filler outlets.
6. Ice machines.
7. Toilet room lavatories.
8. Teachers' lounge sinks.
9. Nurse's office sinks.
10. Hose bibbs.
11. Athletic field outlets.

1.4 SYSTEM DESCRIPTION

A. Provide complete systems, properly connected, tested, balanced, adjusted, and ready for operation, including all necessary and required controls, safeties, details and accessories, including (but not limited to):

1. Sanitary drainage and vent systems.
2. Storm drainage and roof drainage systems.
3. Water distribution systems.
4. Plumbing fixtures.
5. Natural gas piping systems.
6. Electrical control wiring to equipment furnished in this Contract.
7. Miscellaneous items.

1.5 COORDINATION PROCEDURES

A. Coordinate construction operations and construction schedule of plumbing work with other contractors in accordance with Section 01 31 00 "Project Management and Coordination" and as modified below.

1. Pre-Installation Conference:

   a. Attend pre-installation conference. Arrange for all subcontractors to be in attendance.

2. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

3. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Section 08 31 13 "Access Doors and Frames."

4. Coordinate Plumbing Work with HVAC systems, lighting fixtures, ceiling mounted devices, ceiling heights, materials, structural work, maintenance clearances, and electric code clearance and building systems.

5. Notify Owner's Project Representative and Architect in case of unresolved interferences prior to installation of Plumbing Work.

6. Adjust exact size, location and offsets of pipes to achieve reasonable appearance objectives in open areas without ceilings without increase in Contract Sum.

1.6 SUBMITTALS, GENERAL

A. Comply with requirements of SECTION 01 33 00 “Submittal Procedures” for each individual Section and as modified below.

B. Submit all action submittals required by individual Section concurrently.

1. As-Specified Products: If product to be incorporated into Project is as specified by name and product designation in Part 2 of product specification, and will be installed as specified in Part 3, and only where allowed as such in submittal portion of product specification, then submit “As-Specified Verification Form” (attached to SECTION 01 33 00 “Submittal Procedures”) in lieu of “Product Data” identified in the Action Submittal.

2. Do not use “As Specified Verification Form” unless specifically indicated in detailed product specification.

3. Equivalent Products or Substitutions: If product to be incorporated into Project is <u>not</u> specified by name and product designation in Part 2 below, comply with all Product Data requirements specified.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sleeves and sleeve seals. Include rated capacities, and furnished specialties and accessories.

1. Penetration firestopping materials.
2. Penetration firestopping assembly drawings.

1.8 INFORMATIONAL SUBMITTALS

A. Lab results for lead testing prior to commencing work.
B. Contract Closeout Submittals: Comply with requirements of Section 01 77 00 “Closeout Procedures”.

1.9 QUALITY ASSURANCE.

A. Provide installation, testing and materials in accordance with Federal, State and Local Building, Health, Plumbing and Electrical Codes, Laws, Ordinances, and Regulations that apply to Plumbing Work.

1. Comply with applicable requirements of following documents:

a. New York State Uniform Fire Prevention and Building Code.
b. 2020 Building Code of New York State.
c. 2020 Fire Code of New York State.
d. 2020 Plumbing Code of New York State.
e. 2020 Mechanical Code of New York State.
f. 2020 Fuel Gas Code of New York State.
g. 2020 Energy Conservation Construction Code of New York State.
h. New York State Education Department Manual of Planning Standards.
i. In event of a conflict between the Codes identified above and Contract Documents, comply with more stringent requirement.

2. Comply with applicable Utility Company Regulations.

3. Obtain and pay for necessary inspections, certificates, and permits from applicable agencies. Perform required tests in accordance with regulation of agency having jurisdiction. Submit certificates of approval prior to the date of Substantial Completion as defined in Section 01 77 00 “Closeout Procedures”.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code-Steel."

C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is submitted to the Architect and approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Packing and Shipping: Ship materials in manufacturer’s containers, fully identified with manufacture’s name, trade name, type, class, style, model, grade, size and color.

C. Storage and Protection:

1. Store materials, equipment, fixtures, pipe, fittings, and attachments, under cover, off ground in original containers as applicable, and protect from physical and weather damage while in storage and during construction.

2. Furnish extra materials identified in technical sections, in original manufacturers' containers and packaging, to Owner at location identified during prebid conference. Obtain receipt from Owner upon delivery of extra materials and send copy of receipt to Architect.

3. Replace or repair damaged, rusted, corroded or otherwise unusable materials physically damaged or weather damaged equipment as determined by Architect, at no change in Contract Sum.

1.11 PROJECT/SITE CONDITIONS

A. Existing Conditions:

1. Potable water testing for lead prior to commencing any work: A baseline for lead testing must be set. Coordinate with Owner to schedule potable water lead testing in each building where modifications to the potable water outlets are to take place.

2. Engage a qualified laboratory to test water samples from all potable water outlets scheduled for replacement in accordance with NYS Law 10 CRR-NY 67-4.

B. Take note of any existing potable water outlets scheduled for replacement that exceed the action level (5 micrograms per liter) according to NYS Law 10 CRR-NY 67-4.

C. Rodent Proofing:

1. Strainer Plates: All strainer plates on drain inlets shall be designed and installed so that all openings are not greater than a 1/2 inch in least dimension. Refer to Section 22 13 19 "Sanitary Waste Piping Specialties" and 22 14 23 "Storm Drainage Piping Specialties" for additional requirements.

2. Openings for Pipes: In or on structures where openings have been made in walls, floors or ceilings for the passage of pipes, such openings shall be closed and protected by the installation of approved metal collars that are securely fastened to the adjoining structure. Refer to Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing piping" and 22 05 18 "Escutcheons for Plumbing Piping" for additional requirements.

D. Protection of Plumbing Systems:

1. Corrosion: Provide corrosion protection for pipes passing through concrete or cinder walls and floors or buried in corrosive soil conditions.

a. Provide oversized sleeves or core drilled holes to eliminate rubbing on above grade piping installations. Refer to Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping" for pipe sleeve and core drilling requirements.

b. Refer to individual Division 22 piping Sections for corrosion protection on buried piping installations in corrosive soil conditions.

2. Stress and Strain: Install plumbing systems in a manner that prevents stresses and strains that exceed the structural strength of the pipe. Install piping systems to accommodate expansion, contraction and structural settlement.

a. Provide plastic grommets on pipes running horizontally through metal studs to eliminate rubbing on above grade piping installations. Refer to Section 22 05 29 “Hangers and Supports for Plumbing Piping and Equipment” for plastic grommet requirements.

3. Freezing: Do not install water, soil, waste or storm piping outside of a building, in attics or crawlspaces, conceal in outside walls or in any other place subjected to freezing temperatures without providing measures to keep the contents of the piping system from freezing.

E. Field Measurements:

1. Layout of equipment, piping, and similar components in Drawings is diagrammatic. Review Drawings to identify interference with other construction and verify dimensions at Site prior to beginning installation.

a. Obtain exact location of all items and openings and confirm all existing conditions in field.

b. Obtain exact location and roughing requirements for all equipment furnished by others, but installed by this Contractor before roughing. Owner reserves right to make reasonable changes prior to "roughing-in" without increase in Contract Sum.

2. Report any conflicts to Architect in writing before beginning installation.

3. Provide fittings, horizontal and vertical offsets, elevation changes, etc. required to install Plumbing Work. Do not infer that Drawings show level of detail indicating every offset, elbow, union, fitting, elevation changes, or other aspect required for complete installation.

4. Install Plumbing Work with proper provisions for removal and/or access to valves, traps, cleanouts, etc.

1.12 SEQUENCING AND SCHEDULING

A. Perform Plumbing Work in cooperation with Owner, Architect, Construction Manager, and all Contractors on this Project, and other separate Contractors at the Site.

1. Coordinate Plumbing Work with construction schedule requirements in Division 01
2. Coordinate all submittals with the construction schedule and with requirements and schedules contained in Section 01 33 00 “Submittals Procedures.”
3. Immediately report any delays in receipt of materials required for Plumbing Work including circumstances causing delays.

B. Refer to Division 01 for cooperation between Contractors. Prior to start of construction:

1. Obtain from Contract Drawings or Architect, exact location of items and openings in construction. Conform to existing conditions in field.

2. Review applicable Shop Drawings of all Contracts.

3. If conflict occurs between Contract Drawings, advise Architect in writing before beginning installation and comply with Architect's directions.

4. Obtain exact location and roughing requirements for equipment furnished by other Contractor or by Owner but installed by Contractor responsible for Plumbing Work before beginning roughing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Minimum Material Requirements:

1. Construct potable water systems and equipment according to AWWA standards.

2. Provide electrical equipment and systems meeting UL standards and requirements of NEC.

3. Provide UL label on all equipment and material with listing service.

4. Material Flammability:

a. Flame spread rating of 25 or less.
b. Smoke developed rating of 50 or less.

5. Equipment Verification: Carefully check manufacturer's drawings and specifications as they affect their equipment; follow factory instructions for roughing, installation, connection, filling, lubrication, testing, balancing, adjusting, alignment, wiring, and start-up operation.

2.2 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
C. Design Mix: 5000 psi, 28-day compressive strength.
D. Packaging: Premixed and factory packaged.

2.3 SEALANTS

A. Comply with requirements for sealants in non-fire rated penetrations specified in Section 07 92 00 "Joint Sealants."

B. Silicone Sealant, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GE Construction Sealants; Momentive Performance Materials Inc.
2. Sherwin-Williams Company (The).
3. Sika Corporation.
4. The Dow Chemical Company.

D. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.

2.4 PENETRATION FIRESTOPPING

A. Comply with requirements for sealants in fire rated penetrations specified in Section 07 84 13 “Penetration Firestopping”.

B. Submit Manufacturers Product Data Sheets for each type of product selected. Certify that Firestop Material is free of asbestos and lead paint and complies with local regulations.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Submit system design listings, including illustrations from qualified testing and inspection agency that is applicable to each firestop configuration.

D. Submit a project specific Penetration Firestopping Schedule indicating where each firestop configuration will be used.

2.5 ACCESS DOORS

A. Comply with requirements for access doors specified in Section 08 31 13 “Access Doors and Frames” for product requirements.

B. Access Door Sizes for Plumbing Applications:

1. Single Valve:

a. 1 NPS and Smaller Valve Size: 8 inches by 8 inches.
b. 1-1/2 NPS and 2 NPS Valve Size: 12 inches by 12 inches.
c. 3 NPS and 4 NPS Valve Size: 18 inches by 18 inches.

2. Two Valves:

   a. 2 NPS and Smaller Valve Size: 12 inches by 12 inches.
   b. 3 NPS and 4 NPS Valve Size: 18 inches by 18 inches.

3. Condensate Drain Connection: 18 inches by 18 inches.

4. Other Devices: 12 inches by 12 inches.

2.6 PAINT AND FINISHES

A. Refer to Section 09 91 00 "Painting" for interior painting and finishing of plumbing piping, equipment and systems.

2.7 FOODSERVICE EQUIPMENT AND FIXTURES

A. Refer to Section 11 40 00 "Foodservice Equipment" for foodservice equipment and fixtures requiring plumbing piping rough-ins and connections.

B. Provide plumbing piping rough-ins and connections to food service fixtures and equipment.

C. Provide plumbing piping rough-ins and connections to relocated food service fixtures and equipment.

D. Verification of Locations and Dimensions

1. New Equipment: Verify exact locations and roughing-in dimensions for each connection and installation from equipment shop drawings furnished by Contractor Responsible for Kitchen Equipment before beginning installation and provide required adjustments to locations or dimensions.

2. Relocated Equipment: Verify exact locations and roughing-in dimensions for each connection and installation of relocated equipment and fixtures by inspecting existing installations prior to removal and relocation. Disconnect existing equipment to be relocated or removed.

E. Provide final plumbing connections to kitchen equipment including interconnecting and final hook-up of plumbing fixtures and piping, valves, traps, fittings, shutoff valves etc. required for complete and operating system.

F. Install loose plumbing devices, i.e. faucets, pressure regulators relief valves, vacuum breakers, strainers, drains, etc. furnished with kitchen equipment and fixtures at locations indicated on approved equipment shop drawings and equipment product data sheets submitted by Contractor Responsible for Kitchen Equipment. Obtain receipt of delivery for materials supplied by Prime Contractor(s).

G. Provide indirect waste from kitchen equipment and fixtures at locations indicated on equipment shop drawings and equipment product data sheets submitted by Contractor Responsible for Kitchen Equipment. Obtain receipt of delivery for materials supplied by Prime Contractor(s). Route indirect waste to floor drains or floor sinks with air gap at terminus.

H. Verify exact locations and roughing-in dimensions for each connection and installation from Roughing Drawings and Assembly Drawings of kitchen equipment accepted by Architect before beginning installation. Obtain Roughing Drawings and Assembly Drawings from Contractor Responsible for Kitchen Equipment Installation.

I. Install plumbing rough-ins as required for complete and operable installation meeting installation guidelines established by equipment manufacturer.

J. Install accessible plumbing systems and components in locations and arrangement to allow for regular cleaning of surfaces. Do not support piping from floor where regular cleaning is required.

K. Maintain 6-inch clear space between floor and plumbing piping, valves, fitting, devices to aid in cleaning floors. Provide supports to bracing piping from walls or equipment.

2.8 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

1. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Hart Industries International, Inc.
4) Jomar International Ltd.
5) Matco-Norca, Inc.
6) McDonald, A. Y. Mfg. Co.
7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
8) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 125 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PROJECT/SITE CONDITIONS

A. Perform the following tests and inspections:

1. Lead Testing Prior to Commencing Construction:

a. Engage a qualified laboratory to collect and test water samples from all potable water outlets scheduled for replacement in accordance with NYS Law 10 CRR-NY 67-4.

b. Collect a first-draw sample from a cold-water outlet at each potable water outlet in the building where outlets are scheduled to be replaced as a part of this Contract.

c. Have samples analyzed for lead content by a State Certified testing lab approved to perform such analyses by the Department's Laboratory Approval Program (ELAP). Submit copy of results to Owner and Architect/Engineer as a base line of water quality in the building before construction.

1) Notify Owner and Architect in writing of any potable water outlets that exceed the lead action level (5 micrograms per liter).

2. Lead Testing After Construction is Complete:

a. Engage a qualified laboratory to collect and test water samples in accordance with NYS Law 10 CRR-NY 67-4.

b. Collect a first-draw sample from all potable water outlets in the building where outlets were replaced or added as a part of this Contract.

c. Have samples analyzed for lead content by a State Certified testing lab approved to perform such analyses by the Department's Laboratory Approval Program (ELAP). Submit copy of results to Owner and Architect/Engineer.

1) Notify Owner and Architect in writing of any potable water outlets that exceed the lead action level (5 micrograms per liter).

d. Potable water outlets replaced under this contract that exceed the lead action level (5 micrograms per liter):

1) Compare to the levels recorded prior to construction. If levels are increased from pre-construction levels, replace faucets and/or supply stops with new materials, and retest portion thereof until sample results are at or below the preconstruction level.

2) Notify Owner and Architect in writing of any potable water outlets that continue to exceed the lead action level (5 micrograms per liter).

e. Newly installed potable water outlets that exceed the lead action level (5 micrograms per liter):

1) Replace faucets and/or supply stops with new materials, and retest portion thereof until sample results are below the lead action level (5 micrograms per liter).

2) Notify Owner and Architect in writing of any potable water outlets that continue to exceed the lead action level (5 micrograms per liter).

3) Coordinate with the Owner and Architect to implement a Remedial Action Plan to mitigate the lead level at the outlet.

3.2 PLUMBING DEMOLITION

A. Refer to Section 02 41 19 "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.

1. Remove Piping: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Abandon Piping in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Remove Equipment: Disconnect and cap services and remove equipment.
4. Remove and Reinstall Equipment: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Remove and Salvage Equipment: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is rendered unserviceable during the process of demolition, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Unless specific mounting heights are indicated, install equipment to allow maximum possible headroom.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Sections, Section 22 05 29 “Hangers and Supports for Plumbing Piping and Equipment”, for detailed additional requirements.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
C. Field Welding: Comply with AWS D1.1.

3.5 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.
D. Avoid air entrapment during placement of grout.
E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout.

3.6 SEALANTS

A. Install sealants according to the requirements specified in Section 07 92 00 "Joint Sealants.”
B. Refer to individual Division 22 plumbing fixture and equipment Sections for specific sealant and caulking requirements.

3.7 FIRESTOPPING

A. Install firestopping according to the requirements specified in Section 07 84 13 “Penetration Firestopping.”

B. Applied Fireproofing:

1. Coordinate the installation of hangers, supports and accessories from the structural steel with the fireproofing installation. Install all hangers and supports prior to installation of fireproofing.

2. Repair or replace existing fireproofing removed as a part of Plumbing Work installation.

   a. Employ the services of an approved fireproofing contractor to repair or replace the fireproofing by patching any areas that have been removed or damaged due to the installation of work after the completion of the fireproofing.

   b. Repaired or replacement fireproofing shall match the fireproofing adjacent to the repaired area. All warranties shall be maintained.

3.8 ACCESS DOORS

A. Install access doors according to the requirements specified in Section 08 31 13 “Access Doors and Frames.”

B. Install access doors where shown on Drawings or where required for access to plumbing system components requiring service (i.e. valves, equipment, slip joints, unions, gauges, etc.) and are located in concealed installations.

3.9 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Section 09 91 00 "Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.10 DIELECTRIC FITTINGS

A. Install dielectric fittings according to the specific requirements in the Division 22 Sections specifying piping systems.

END OF SECTION 22 05 00

SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeve-seal systems.
2. Grout.
3. Silicone sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sleeves seals.

1. Sleeve-seal systems.
2. Firestopping.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES WITHOUT WATERSTOP

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron, with plain ends.
B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
C. Steel Sheet Sleeves: ASTM A653/A653M, 24 gauge minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint

2.2 SLEEVES WITH WATERSTOP

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, LLC.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.
4. Metraflex Company (The).

B. Description: Manufactured galvanized steel, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

2.3 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Jay R. Smith Mfg Co; a division of Morris Group International.
2. Wade; a subsidiary of McWane Inc.
3. Zurn Industries, LLC.

B. Description: Manufactured, Dura-coated or Duco-coated galvanized cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.4 PENETRATION FIRESTOPPING

A. Comply with requirements for sealants in fire rated penetrations specified in Section 07 84 13 “Penetration Firestopping” and Section 22 05 00 “Common Work Results for Plumbing.”

2.5 GROUT

A. Refer to grout product requirements specified in Section 22 05 00 “Common Work Results for Plumbing.”

2.6 SILICONE SEALANTS

A. Comply with requirements for silicone sealants specified in Section 07 92 00 "Joint Sealants" and Section 22 05 00 “Common Work Results for Plumbing.”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION OF SLEEVES - GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.

2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Run pipe insulation continuously through sleeve.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
4. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 07 84 13 "Penetration Firestopping."

3.3 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs are constructed.
B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
C. Secure nailing flanges to concrete forms.
D. Using grout, seal the space around outside of sleeves. Select to maintain fire resistance of floor/slab/wall.

3.4 INSTALLATION OF STACK-SLEEVE FITTINGS

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

2. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

3. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

4. Using waterproof silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.

B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

3.5 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Assemble sleeve-seal system components and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
2. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.7 SLEEVE SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above and below Grade:

a. Sleeves with waterstops.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

a. Sleeves with waterstops.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs above Grade:

a. Sleeves with waterstops or stack-sleeve fittings.

4. Interior Partitions:

a. Sleeves without waterstops.

END OF SECTION 22 05 17

SECTION 22 05 18 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes escutcheons and floor plates.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. Jones Stephens Corp.
4. Keeney Manufacturing Company (The).
5. ProFlo; a Ferguson Enterprises, Inc. brand.

B. Escutcheon Types:

1. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
2. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished, chrome-plated finish and spring-clip fasteners.
3. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
4. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install escutcheons for exposed piping penetrations of walls, ceilings, and finished floors.

3.3 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping and Relocated Existing Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
2. Chrome-Plated Piping: One piece, cast brass with polished, chrome-plated finish.
3. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
4. Bare Piping at Wall, Floor or Ceiling Penetrations in Finished Spaces: One piece, cast brass or split-casting brass type with polished, chrome-plated finish.
5. Bare Piping in Unfinished Service Spaces or Equipment Rooms: One piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.

B. Escutcheons for Existing Piping (only required where impacted by new walls, floors or ceilings):

1. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
2. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
3. Bare Piping at Wall, Floor or Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
4. Bare or Insulated Piping in Unfinished Service Spaces and Equipment Rooms: No escutcheons required.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.4 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 22 05 18

SECTION 22 05 19 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gauges.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Section 01 33 00 "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gauges.
4. Snubbers.
5. Valves.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of gauge to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Domestic water for plumbing piping intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.

2.2 THERMOMETERS, LIQUID IN GLASS, LEAD FREE - PLASTIC CASE, INDUSTRIAL STYLE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Weiss Instruments, Inc; Vari-angle Model 9VU Series or a comparable product by one of the following:

1. Ernst Flow Industries.
2. WATTS; A Watts Water Technologies Company.

B. Source Limitations: Provide liquid-in-glass, lead-free, plastic-case, industrial-style thermometers from single manufacturer.

C. Standard: ASME B40.200.

D. Case: GE Valox® polyester, 40 percent glass/mineral reinforced; 9-inch nominal size unless otherwise indicated.

E. Case Form: Adjustable angle unless otherwise indicated.

F. Tube: Glass with magnifying lens and blue organic liquid, mercury free.

G. Tube Background: Nonreflective aluminum with permanent scale markings graduated in deg F.

H. Window: Glass.

I. Stem: Aluminum, lead-free brass, or stainless steel and of length to suit installation.

1. Design for Thermowell Installation: Bare stem.

J. Connector: 1-1/4 inches, with ASME B1.1 or ASME B1.20.1 screw threads to fit thermowell.

K. Accuracy: Plus or minus 1 percent of span or one scale division, to a maximum of 1.5 percent of span.

2.3 THERMOWELLS, LEAD FREE

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: Lead-free copper.
D. Material for Use with Steel Piping: Type 304 stainless steel.
E. Type: Stepped shank unless straight or tapered shank is indicated.
F. External Threads: NPS 1/2, NPS 3/4, or NPS 1, or as required to match threaded opening in pipe.
G. Internal Threads: Size and thread type as required to match thermometer mounting threads.
H. Bore: Diameter required to match thermometer bulb or stem.
I. Insertion Length: Length to extend to match thermometer stem length.
J. Lagging Extension: Include on thermowells for insulated piping and tubing. Extension is to be of sufficient length to extend beyond finished insulation surface.
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 PRESSURE GAUGES, DIAL TYPE, LEAD FREE - DIRECT MOUNTED, METAL CASE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Weiss Instruments, Inc; Series 4CTSLF or a comparable product by one of the following:

1. Ernst Flow Industries.
2. Tel-Tru Manufacturing Company.
3. Trerice, H. O. Co.

B. Source Limitations: Provide dial-type, lead-free, direct-mounted, metal-case pressure gauges from single manufacturer.

C. Standard: ASME B40.100.

D. Case: Liquid-filled, sealed solid-front, pressure-relief type(s); stainless-steel; 4-1/2-inch nominal diameter.

E. Pressure-Element Assembly: Lead-free Bourdon tube.

1. Pressure Connection: Lead-free brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
2. Movement: Mechanical, with link to pressure element and connection to pointer.
3. Dial: White coated metal lithographed with black scale markings graduated in psi.
4. Pointer: Dark-colored metal.
5. Window: Safety glass lens.
6. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAUGE ATTACHMENTS, LEAD FREE

A. Snubbers: ASME B40.100, lead-free brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston or porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Lead-free brass or stainless-steel quarter turn ball valve, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION OF METERS AND GAUGES

A. Install thermometer with thermowell at each required thermometer location.
B. Install thermowells in vertical position in piping tees.
C. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
D. Install thermowells with extension on insulated piping.
E. Fill thermowells with heat-transfer medium.
F. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
G. Install direct-mounted pressure gauges in piping tees with pressure gauge located on pipe at most readable position.
H. Install remote-mounted pressure gauges on panel.
I. Install valve and snubber in piping for each pressure gauge for fluids.
J. Install test plugs in piping tees.

3.3 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow space for service and maintenance of meters, gauges, machines, and equipment.

3.4 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.
B. Adjust faces of meters and gauges to proper angle for best visibility.

3.5 THERMOMETER, LEAD FREE, APPLICATION

A. Thermometers at inlet and outlet of each domestic water heater are to be the following:

1. Plastic case, industrial-style, liquid-in-glass type.

B. Thermometer stems are to be of length to match thermowell insertion length.

3.6 THERMOMETER, LEAD FREE, SCALE-RANGE APPLICATION

A. Scale Range for Domestic Water Piping: 30 to 240 deg F.
B. Insert additional paragraphs for thermometer scale ranges and applications.

3.7 PRESSURE-GAUGE APPLICATION

A. Pressure gauges at suction and discharge of each domestic water pump are to be the following:

1. Liquid filled, sealed solid front, pressure relief, direct mounted, metal case.

3.8 PRESSURE-GAUGE SCALE-RANGE APPLICATION

A. Scale Range for Domestic Water Piping:

1. 0 to 100 psi.

END OF SECTION 22 05 19

SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ball valves.
2. Butterfly valves.
3. Check valves.
4. Plug valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
D. NRS: Nonrising stem.
E. OS&Y: Outside screw and yoke.
F. PTFE: Polytetrafluoroethylene.
G. RPTFE: Reinforced polytetrafluoroethylene.
H. RS: Rising stem.
I. SWP: Steam working pressure.
J. WOG: Water, oil, gas.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1. Ball valves.
2. Butterfly valves.
3. Check valves.
4. Lubricated plug valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooved ends, press ends, solder ends, and weld ends.
3. Set ball valves open to minimize exposure of functional surfaces.
4. Set butterfly valves closed or slightly open.
5. 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 SOURCE LIMITATIONS

A. Obtain each type of valve from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic-water piping valves intended to convey or dispense water for human consumption must comply with the U.S. Safe Drinking Water Act (SDWA), requirements of authorities having jurisdiction, and NSF 61/NSF 372; or to be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for cast-copper solder-joint connections.
6. ASME B16.22 for wrought-copper solder-joint connections.
7. ASME B16.34 for flanged- and threaded-end connections.
8. ASME B16.51 for press joint connections.
9. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are unacceptable.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Bypass and Drain Connections: MSS SP-45.

H. Valve Actuator Type:

1. Hand Lever: For quarter-turn ball valves smaller than NPS 4.

I. Valves in Insulated Piping:

1. Provide 2-inch extended neck stems.

2. Provide extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.

3. Provide memory stops that are fully adjustable after insulation is applied.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, Lead-Free, Two-Piece with Full Port, and Stainless-Steel Trim, Solder or Threaded Ends (NPS 2 and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; Model S/T-585-66-LF-NS or a comparable product by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves; 70LF-140, 70LF-240.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc; LFB6000-SS, LFB6001-SS.

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: Soldered or threaded.
g. Seats: PTFE or TFE.
h. Stem: Type 316 stainless steel.
i. Ball: Type 316 stainless steel, vented.
j. Port: Full.
k. Handle: Insulated extension handle.

B. Bronze Ball Valves, Lead-Free, Two-Piece with Full Port, and Stainless-Steel Trim, Press Ends (NPS 2 and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; Model PC-585-80-LF-NS or a comparable product by one of the following:

   a. Apollo Flow Controls; Conbraco Industries, Inc.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-110 or MSS-145.
   b. CWP Rating: Minimum 200 psig.
   c. Body Design: Two piece.
   d. Body Material: Bronze.
   e. Ends: Press.
   f. Press Ends Connections Rating: Minimum 200 psig.
   g. Seats: PTFE or TFE Reinforced PTFE.
   h. Stem: Bronze or brass.
   i. Ball: Stainless steel.
   j. Port: Full.
   k. O-Ring Seal: EPDM.
   l. Handle: Insulated extension handle.

2.4 DUCTILE IRON, SINGLE-FLANGE (LUG-TYPE) BUTTERFLY VALVES

A. Iron, Single-Flange (Lug-Type) Butterfly Valves with Aluminum-Bronze Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; LD-2000. or a comparable product by one of the following:

   a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
   b. Hammond Valve.
   c. Jenkins Valves; a Crane Co. brand.
   d. Legend Valve & Fitting, Inc.
   e. Milwaukee Valve Company.
   f. Stockham; a Crane Co. brand.
   g. WATTS.

2. Standard: MSS SP-67, Type I.

3. CWP Rating: 200 psig.

4. Body Design: Single flange (lug type), suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

5. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.

6. Seat: EPDM.

7. Stem: One- or two-piece stainless steel.

8. Disc: Aluminum bronze.

2.5 DUCTILE-IRON, GROOVED-END BUTTERFLY VALVES

A. Ductile Iron, Grooved-End Butterfly Valves, 300 CWP:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; Model GD-4765N or a comparable product by one of the following:

    a. Hammond Valve.
    b. Kennedy Valve Company; a division of McWane, Inc.
    c. Red-White Valve Corp.
    d. Shurjoint; a part of Aalberts Integrated piping Systems.
    e. Victaulic Company.
    f. WATTS.

2. Standard: MSS SP-67, Type I.

3. CWP Rating, NPS 8 and Smaller: 300 psig.

4. CWP Rating, NPS 10 and Larger: 200 psig.

5. Body Material: Coated, ductile iron.

6. Stem: Two-piece stainless steel.

7. Disc: Coated, ductile iron.

8. Seal: EPDM.

2.6 SILICON BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Nonmetallic Disc, Class 125:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; T/S/PC-413-Y-LF or comparable product by one of the following:

    a. Hammond Valve.
    b. Milwaukee Valve Company.
    c. WATTS.

2. Description:

a. Standard: MSS SP-139.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Horizontal or vertical (flow in upward direction) flow.
d. Body Material: Silicon bronze (ASTM listed), corrosion resistant.
e. Ends: Threaded, soldered, or press. See valve schedule articles.
f. Disc: PTFE.

2.7 LUBRICATED PLUG VALVES

A. Class 125, Cylindrical, Lubricated Plug Valves with Threaded Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Homestead Valve; a division of Olson Technologies, Inc.
b. Milliken Valve Company.
c. R & M Energy Systems; a unit of Robbins & Myers, Inc.

2. Description:

a. Standard: MSS SP-78, Type IV.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
d. Pattern: Regular or short.
e. Plug: Cast iron or bronze with sealant groove.

B. Class 125, Cylindrical, Lubricated Plug Valves with Flanged Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Homestead Valve; a division of Olson Technologies, Inc.
b. Milliken Valve Company.
c. R & M Energy Systems; a unit of Robbins & Myers, Inc.

2. Description:

a. Standard: MSS SP-78, Type IV.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
d. Pattern: Regular or short
e. Plug: Cast iron or bronze with sealant groove.

C. Class 250, Cylindrical, Lubricated Plug Valves with Threaded Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Homestead Valve; a division of Olson Technologies, Inc.
   b. Milliken Valve Company.
   c. R & M Energy Systems; a unit of Robbins & Myers, Inc.

2. Description:

   a. Standard: MSS SP-78, Type IV.
   b. CWP Rating: 400 psig.
   c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
   d. Pattern: Regular or short.
   e. Plug: Cast iron or bronze with sealant groove.

D. Class 250, Cylindrical, Lubricated Plug Valves with Flanged Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Homestead Valve; a division of Olson Technologies, Inc.
   b. Milliken Valve Company.
   c. R & M Energy Systems; a unit of Robbins & Myers, Inc.

2. Description:

   a. Standard: MSS SP-78, Type IV.
   b. CWP Rating: 400 psig.
   c. Body Material: ASTM A 48/A 48M or ASTM A 126, Grade 40 cast iron with lubrication-sealing system.
   d. Pattern: Regular or short.
   e. Plug: Cast iron or bronze with sealant groove.

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.

F. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION OF VALVES

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.

F. Valve Tags: Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.

2. Butterfly Valve Dead-End Service: Single-flange (lug) type.

3. 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 except where solder-joint valve-end option or press-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Grooved-End Copper Tubing: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Ball Valves: Two-piece with full port and stainless-steel trim. Provide with threaded, solder or press connection-joint ends.
3. Bronze Ball Valves: Three-piece with full port and stainless-steel trim.
4. Silicon Bronze Swing Check Valves: Class 125, nonmetallic disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
2. Iron, Grooved-End Butterfly Valves: 300 CWP.
3. Iron Swing Check Valves: Class 125, metal seats.
4. Iron Swing Check Valves with Closure Control: Class 125, lever and weight.
5. Iron, Grooved-End Swing Check Valves: 300 CWP.
6. Iron, Center-Guided Check Valves: Class 125, globe, resilient seat.
7. Iron Gate Valves: Class 250, OS&Y.

END OF SECTION 22 05 23

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General 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. Pipe-positioning systems.
7. Equipment supports.

1.3 DEFINITIONS

A. Hostile Environments: Pool mechanical rooms, natatorium spaces, rooms or spaces where corrosive chemicals are stored.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sleeves and sleeve seals. Include rated capacities, and furnished specialties and accessories.

1. Insulation shields.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Section 01 33 00 "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. Threaded rod.
2. Adjustable clevis hanger.
3. Adjustable swing-ring band hangers.
4. Adjustable swivel-ring band hangers.
5. Hinged pipe clamps.

6. Riser clamps.
7. Beam Clamps.

C. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Anvil International; a subsidiary of Mueller Water Products Inc.
2. Cooper B-Line, Inc.
3. ERICO International Corporation.
4. PHD Manufacturing, Inc.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
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 and 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 copper-coated steel or stainless steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL HANGER-SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Buckaroos, Inc.
2. CADDY; brand of nVent Electrical plc.
3. Carpenter & Paterson, Inc.
4. Pipe Shields Inc.

B. Insulation-Insert Material for Type "B" and “E” Insulated Piping Support Assemblies: ASTM C552, Type II cellular glass with 100-psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Type "C" and “F” Insulated Piping Support Assemblies: Water-repellent-treated, ASTM C533, 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.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hilti, Inc.
b. ITW Ramset/Red Head; Illinois Tool Works, Inc.

c. MKT Fastening, LLC.
d. Simpson Strong-Tie Co., Inc.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper B-line; brand of Eaton, Electrical Sector.
b. Empire Tool and Manufacturing Co., Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
e. MKT Fastening, LLC.

2. Indoor Applications: Zinc-coated or stainless steel.

3. Outdoor Applications: Stainless steel.

2.6 PIPE-POSITIONING SYSTEMS

A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 PLASTIC GROMMETS

A. Snap-in type plastic grommets for stud webs to protect plumbing piping. Prevent metal-to-metal contact between piping and studs.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.9 MATERIALS

A. Carbon Steel: ASTM A1011/A1011M.

B. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.

C. Stainless Steel: ASTM A240/A240M.

D. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.

5. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.
C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 PLASTIC GROMMETS

A. Provide grommets for bare pipes penetrating vertically or horizontally through metal stud knockouts.

3.6 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.

3.7 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

A. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in and Section 09 96 00 "High-Performance Coatings” for interior installations.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.8 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and support, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal hanger-shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Piping in general service applications:

a. Piping Installed in Metal Stud Cavities:

1) NPS 1/2NPS 1/2 to 3/4: After tubing and continuous insulation passes through the hole in stud or bracket, position the insert around tubing and push insert through the hole until the tabs click and lock into place.

b. Bare Copper Piping Systems:

1) NPS 1-1/4 and Smaller: Adjustable, plastic coated copper swivel loop hanger for suspension of non-insulated stationary pipes.
2) NPS 1-1/2 and Larger: Copper plated clevis hanger for suspension of non-insulated stationary pipes. Hanger sized on outside pipe diameter.

c. Bare Ferrous Piping Systems:

1) NPS 1-1/4 and Smaller: Heavy duty electro-galvanized steel swivel loop hanger for suspension of non-insulated stationary pipes.
2) NPS 1-1/2 and Larger: Electro-galvanized clevis hanger for suspension of non-insulated stationary pipes. Hanger sized on outside pipe diameter.

d. Insulated Piping Systems:

1) NPS 2 and Smaller: Electro-galvanized clevis hanger with galvanized steel thermal-hanger shield insert for suspension of insulated stationary pipes. Hanger sized on outside insulation diameter.

2) NPS 2-1/2 and Larger: Electro-galvanized clevis hanger with separate or integral galvanized steel thermal-hanger shield insert for suspension of insulated stationary pipes. Hanger sized on outside insulation diameter.

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.

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. 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.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

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. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

P. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment and piping labels.
2. Valve tags and signage.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Valve function signage.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Section 01 33 00 "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. Equipment labels.
2. Pipe labels.

C. Samples: For color, letter style, and graphic representation required for each identification material and device.

D. Equipment-Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

E. Valve-numbering scheme.

F. Valve Schedules: For each piping system. Include in operation and maintenance manuals.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate installation of identifying devices with locations of access panels and doors.
C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady, Inc.
2. Craftmark Pipe Markers.
3. Seton, Inc.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Arc-Flash Warning Signs: Provide arc-flash warning signs in locations and with content in accordance with requirements of OSHA and NFPA 70E

J. Label Content: Include caution and warning information plus emergency notification instructions.

1. Grease interceptors: A minimum nominal width of 14 inches and a minimum nominal height of 10 inches and to read as follows:



2.2 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady, Inc.
2. Craftmark Pipe Markers.
3. Seton, Inc.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing and separate self-adhesive direction arrow tape on each end fully wrapped around pipe.

F. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:

1. Pipe size.
2. Flow-Direction Arrows: Include flow-direction arrows on main distribution piping. Arrows may be either integral with label or applied separately.
3. Lettering Size: At least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.

2.3 STENCILS

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. Craftmark Pipe Markers.
2. Kolbi Pipe Marker Co.
3. Marking Services Inc.
4. Pipemarker.com; Brimar Industries, Inc.

B. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Aluminum, brass, or fiberboard.
2. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors in accordance with ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
4. Letter and Background Color: As indicated for specific application under Part 3.

2.4 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Craftmark Pipe Markers.
3. Kolbi Pipe Marker Co.
4. Marking Services Inc.
5. Pipemarker.com; Brimar Industries, Inc.
6. Seton Identification Products; a Brady Corporation company.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.04-inch minimum thickness, with predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass link chain or S-hook.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Include valve-tag schedule in operation and maintenance data.

2.5 VALVE FUNCTION SIGNAGE

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. Brady, Inc.
2. Craftmark Pipe Markers.
3. Seton, Inc.

B. Plastic Signage:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

2. Letter Color: White.

3. Background Color: Black.

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

7. Fasteners: Stainless-steel rivets or self-tapping screws.

8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Signage Content: Include valve's unique verbiage where indicated on Drawings, unless otherwise specified.

1. Stop and drain valves serving an exterior wall hydrant: Text to read “Wall Hydrant Shutoff Valve and Drain Plug”.
2. Bypass valves: Text to read “Bypass Valve-Normally Closed”.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate installation of identifying devices with locations of access panels and doors.
C. Install identifying devices before installing acoustical ceilings and similar concealment.
D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

A. Permanently fasten labels on each item of plumbing equipment.

B. Sign and Label Colors.

1. White letters on an ANSI Z535.1 safety-green background.

C. Locate equipment labels where accessible and visible.

D. Provide nameplates for equipment with identifying name of equipment and function.

3.4 INSTALLATION OF PIPE LABELS

A. Piping Color Coding: Painting of piping is specified in Section 09 91 00 "Painting

B. Install pipe labels showing service and flow direction with permanent adhesive on pipes.

C. Stenciled Pipe Label Option: Stenciled labels showing service and flow direction may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

D. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Within 3 ft. of each valve and control device.
2. At access doors, manholes, and similar access points that permit view of concealed piping.
3. Within 3 ft. of equipment items and other points of origination and termination.
4. Spaced at maximum intervals of 25 ft along each run. Reduce intervals to 10 ft in areas of congested piping and equipment.

E. Do not apply plastic pipe labels or plastic tapes directly to bare pipes conveying fluids at temperatures of 125 deg F or higher. Where these pipes are to remain uninsulated, use a short section of insulation or use stenciled labels.

F. Flow-Direction Flow Arrows: Use arrows, in compliance with ASME A13.1, to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

G. Pipe-Label Color Schedule:

1. Domestic Cold-Water Piping: Black letters on an ANSI Z535.1 safety-green background.
2. Domestic Hot-Water Piping: Black letters on an ANSI Z535.1 safety-green background.
3. Domestic Hot-Water Return Piping Black letters on an ANSI Z535.1 safety-green background.
4. Sanitary Waste and Storm Drainage Piping: Black letters on an ANSI Z535.1 safety-green background.

3.5 INSTALLATION OF VALVE TAGS

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule in the operating and maintenance manual.

B. Valve-Tag Application Schedule: : Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Color: Natural.
2. Letter Color: Black.

C. Provide valve tag for each piping systems valve located above grade.

1. Valve Directory: Provide neat typewritten directory listing valve function, location and identification number.
2. Valve Numbering System: Extension of and compatible with existing valve numbering system, where valves are installed in existing building or in addition to existing building.
3. Verification: Verify existing valve numbers in field and provide valve numbering avoiding duplication of existing numbers.

END OF SECTION 22 05 53

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Roof drains and rainwater leaders.
5. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1. Cellular glass.
2. Flexible elastomeric insulation.
3. Mineral-fiber, preformed pipe insulation.
4. Spray polyurethane foam.
5. Mineral-fiber, hydraulic-setting insulating and finishing cement.
6. Vapor-barrier mastic.
7. Protective shielding piping enclosures.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Provide insulation system installation by qualified Installers who are trained in installation of each proposed insulation material and product with at least one of the following qualifications:

1. Have successfully completed a Mechanical Insulation Apprenticeship program by the Department of Labor, Bureau of Apprenticeship and Training,
2. Have successfully completed an ASHRAE / NIA 8-hour Mechanical Insulation Training course or equal, or

3. Have five years documented experience as a mechanical insulation specialist with references attesting to successful completion of at least three comparable projects.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Glass-Fiber Loose-Fill Insulation: Comply with requirements for glass-fiber loose-fill insulation specified in Section 07 21 00 "Thermal Insulation."

I. Spray polyurethane foam: Comply with requirements for spray polyurethane foam specified in Section 07 21 00 "Thermal 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. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2.3 MASTICS

A. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
b. Eagle Bridges - Marathon Industries; 501.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
d. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.

3. Service Temperature Range: 0 to 180 deg F.

4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.

5. Color: White.

2.4 SEALANTS

A. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: White.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ-SSL: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing, self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.6 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ABI, Ideal Tape Division; 428 AWF ASJ.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
   c. Compac Corporation; 104 and 105.
   d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.

3. Thickness: 11.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.

7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.

3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.

5. Elongation: 500 percent.

6. Tensile Strength: 18 lbf/inch in width.

2.7 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 316; 0.015 inch thick, 1/2 inch wide with wing seal.

B. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. C & F Wire.

2.8 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Truebro; a brand of IPS Corporation.
   b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
B. 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. 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.

3. 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 along both edges of strip.
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.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere 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.

Q. Miscellaneous Voids: Install insulation where indicated and in miscellaneous openings and penetrations in the exterior building envelope, including pipe sleeves, exterior wall hydrants, roof drains, downspout nozzles, pipe chases located on exterior walls, voids and cavity spaces created by Plumbing Work where required to provide continuity and integrity to the building exterior envelope insulation system, sealing gaps and preventing air infiltration, using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

2. Spray Polyurethane Foam: Apply according to manufacturer's written instructions.

   a. Trim and dress surface of spray polyurethane foam to provide smooth, flush surface.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies.
3. Comply with requirements in Section 07 84 13 "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. 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.

8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulation Installation on Roof Drain Bodies:

1. Insulate roof drain bodies using preformed fitting insulation. 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.

2. Adhere fitted PVC cover to insulated Roof Drain Body with PVC Jacket Adhesive. Tape PVC covers to adjoining insulation facing using PVC tape. Seal voids to maintain vapor barrier on drain body assembly.

D. 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.

E. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. Secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. 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 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.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 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.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water (General Building Areas):

1. Mineral-Fiber, Preformed Pipe Insulation with factory applied jacket, Type I:1-inch thickness.

B. Domestic Cold Water located within Masonry Block Wall cores, horizontal runs in metal stud walls or buried conduits:

1. Flexible Elastomeric Insulation: 1/2-inch thick.

C. Domestic Hot and Recirculation Water (General Building Areas):

1. Mineral-Fiber, Preformed Pipe Insulation with factory applied jacket, Type I:

a. Pipes size 1 1/4" or smaller: 1-inch thickness.
b. Pipes size 1 1/2" or larger: 1-1/2-inch thickness.

D. Domestic Hot and Recirculation Water located within Masonry Block Wall cores, horizontal runs in metal stud walls or buried conduits:

1. Flexible Elastomeric Insulation:

a. Pipes size 1 1/4" or smaller: 1/2-inch thickness.
b. Pipes size 1 1/2" or larger: 1-inch thickness.

E. Freezer Condensate Piping:

1. Flexible Elastomeric Insulation: 1/2-inch thick.

F. Stormwater and Overflow:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-inch thick.

G. Roof Drain and Overflow Drain Bodies:

1. Mineral-Fiber, Preformed Pipe Insulation without factory applied jacket, Type I: 2-inch thick.

H. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. Protective Shielding Pipe Enclosure.

3.11 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. Piping, Exposed:

1. PVC: 30 mils thick.

END OF SECTION 22 07 19

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Piping joining materials.
3. Transition fittings.
4. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Pipe and tube.
2. Fittings.
3. Joining materials.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.
B. Lab results for lead testing upon completion of work.

1.5 CLOSEOUT SUBMITTALS

A. Field quality-control reports.
B. Lab results for biological testing showing samples negative for coliform bacteria.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installers of pressure-sealed joints are to be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

1.7 FIELD CONDITIONS

A. Interruption of Existing Water Service: Refer to "Existing Utility Interruptions" paragraph of Section 01 12 00 "Multiple Contract Summary-Project Schedule" for requirements associated with interrupting the existing water service to facilities occupied by the Owner.

B. Refer to the "Project/Site Conditions" article for lead testing requirements prior to commencing any work in Section 22 05 00 "Common Work Results for Plumbing."

C. Coordinate potable water lead testing with Owner prior to starting any construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

A. Potable-water piping and components are to comply with NSF 14, NSF 61, and NSF 372.

2.3 COPPER TUBE AND FITTINGS - DOMESTIC WATER

A. Drawn-Temper Copper Tube ASTM B88, Type L.

B. Annealed-Temper Copper Tube: ASTM B88, Type L.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4.

E. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends. Do not use solder joints on pipe sizes greater than NPS 4.

F. Wrought Copper Unions: ASME B16.22. Do not use solder joints on pipe sizes greater than NPS 4.

G. Grooved, Mechanical-Joint, Copper Tube Appurtenances - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ASC Engineered Solutions.
   b. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
   c. Shurjoint; a part of Aalberts Integrated piping Systems.
   d. Victaulic Company.

2. Source Limitations: Obtain grooved, mechanical-joint copper tube appurtenances from single manufacturer.

3. Grooved-End, Copper Fittings: ASTM B75/B75M copper tube or ASTM B584 bronze castings.

4. Grooved-End-Tube Couplings: To fit copper-tube dimensions; rigid pattern unless otherwise indicated; gasketed fitting, EPDM-rubber gasket, UL classified per NSF 61 and NSF 372, and rated for minimum 180 deg F, for use with ferrous housing and steel bolts and nuts; 300 psig minimum CWP pressure rating.

H. Pressure-Seal-Joint Fittings, Copper or Bronze - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
   b. Elkhart Brass Mfg. Co., Inc.
   c. FNW; Ferguson Enterprises, Inc.
   d. Mueller Streamline Co.; a company of Mueller Industries.
   e. NIBCO INC.
   f. Viega LLC.

2. Source Limitations: Obtain pressure-seal-joint fittings, copper or bronze, from single manufacturer.

3. Housing: Copper.

4. O-Rings and Pipe Stops: EPDM.

5. Tools: Manufacturer's special tools.

6. Minimum 200 psig working-pressure rating at 250 deg F.

2.4 PIPING JOINING MATERIALS - DOMESTIC WATER

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B32, lead-free alloys.

D. Flux: ASTM B813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 TRANSITION FITTINGS - DOMESTIC WATER

A. Install transition couplings at joints of piping with small differences in OD's. Refer to transition fitting products specified in Section 22 05 00 “Common Work Results for Plumbing”.

2.6 DIELECTRIC FITTINGS - DOMESTIC WATER

A. Dielectric Unions and Flanges: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined. Comply with requirements in Section 22 05 00 "Common Work Results for Plumbing."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Refer to the “PROJECT/SITE CONDITIONS” article for lead testing requirements prior to commencing any work in Section 22 05 00 “Common Work Results for Plumbing.”

B. Before proceeding with water piping installation, examine conditions existing at Site and notify affected Contractors and Architect of any construction or any other conditions prevailing which prevent, inhibit, or otherwise interfere with water piping installation.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water piping, NPS 2 and smaller is to be the following:

1. Drawn-temper or annealed-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping, NPS 4or smaller is to be one of the following:

1. Drawn-temper copper tube, ASTM B88, Type L; cast-or wrought- copper, solder-joint fittings; and soldered joints.
2. Drawn-temper copper tube, ASTM B88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Drawn-temper copper tube, ASTM B88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

3.3 EARTHWORK

A. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

3.4 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab in accordance with CDA's "Copper Tube Handbook."

C. Install valves in accordance with Section 22 05 23 "General Duty Valves for Plumbing Piping."

D. Install domestic water piping level without pitch and plumb.

E. Rough-in domestic water piping for water-meter installation in accordance with utility company's requirements.

F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.

I. Install piping to permit valve servicing.

J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

N. Install pressure gauges on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gauges in Section 22 05 19 "Meters and Gauges for Plumbing Piping."

O. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 22 11 23.21 "Inline, Domestic Water Pumps."

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.5 PROTECTION

A. Thermal expansion and contraction: Wrap copper and copper alloy tube passing through a wall, floor, ceiling or partition with tape or pipe insulation. Install tube through an appropriately sized sleeve to allow for thermal movement.

B. Protect against abrasion where copper and copper alloy tube contacts building materials. Wrap tube with tape, pipe insulation, metal stud insulating pipe clamps or suitable method of isolation.

C. Backfill trench and excavations with clean fill which contains no ashes, cinders, refuse, stones, boulders, or other materials which can damage piping or promote corrosive action.

D. Where excessive moisture is anticipated, wrap piping and support hanger with tape to prevent dissimilar metals galvanic corrosion of supporting member.

3.6 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings in accordance with ASTM B828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.

G. Joint Construction for Grooved-End Copper Tubing: Make joints in accordance with AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.7 INSTALLATION OF TRANSITION FITTINGS

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1 1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.8 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings, nipples or unions.

3.9 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

B. Install hangers for copper tube and pipe, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping within 12 inches of each fitting.

D. Support vertical runs of copper tube and pipe to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.10 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.

2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.11 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.12 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system in accordance with either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Repeat procedures if biological examination shows contamination.

e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.13 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.14 FIELD QUALITY CONTROL

A. Perform the following tests:

1. Comply with “Field Quality Control” article in Part 3 of Section 22 05 00 “Common Work Results for Plumbing” for lead testing requirements prior to commencing any work.

2. Piping Inspections:

   a. Do not enclose, cover, or put piping into operation until it has been tested and inspected by the Owner’s Representative.

   b. During installation, notify Owner’s Representative at least two days before inspection must be made. Perform tests specified below in presence of Owner’s Representative:

      1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

      2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

   c. Reinspection: If Owner’s Representative finds that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

   d. Reports: Prepare inspection reports and have them signed by the Owner’s Representative.

3. Above Grade Piping Tests:

   a. Initial Test:

      1) Do not connect fixtures, equipment, and solenoid valves into system during this test.

      2) Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

      3) Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

      4) Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

      5) Cap and subject piping to static water pressure of 150 psi, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

6) Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

7) Prepare reports for tests and for corrective action required.

b. Test After Fixtures are Connected:

1) Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

2) Test system again for 2 hours at 75 psi or prevailing water pressure, whichever is higher.

3) Repair leaks and defects at fixture and equipment connections or at solenoid valves, and retest piping or portion thereof until satisfactory results are obtained.

4) Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing valves.
2. Strainers for domestic water piping.
3. Hose bibbs.
4. Wall hydrants.
5. Drain valves.
6. Water-hammer arresters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for domestic water piping specialties. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. Non-freeze wall hydrants.
2. Moderate-climate wall hydrants.
3. Stop-and-waste drain valves.
4. Water hammer arresters.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Section 01 33 00 "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. Hose bibbs.
2. Hose-end drain valves.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.
B. Test and inspection reports.
C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; Model S-585-66-LF-NS-M or T-585-66-LF-NS-M or a comparable product by one of the following:

    a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    b. Hammond Valve.
    c. Milwaukee Valve Company.
    d. Watts; a Watts Water Technologies Company.

2. Description:

    a. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
    b. Pressure Rating: 400-psig minimum CWP.
    c. Size: NPS 2 or smaller.
    d. Body: Lead free copper alloy.
    e. Port: Full port.
    f. Ball: Chrome-plated brass.
    g. Seats and Seals: Replaceable.
    h. End Connections: Solder joint or threaded.
    i. Handle: Vinyl-covered steel with memory-setting device.

2.4 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Inc; Model T-222-A or F-721-A or comparable product by one of the following:

    a. Conbraco Industries, Inc.
    b. Crane Co.; Crane Valve Group; Crane Valves.
    c. Crane Co.; Crane Valve Group; Jenkins Valves.
    d. Crane Co.; Crane Valve Group; Stockham Div.
    e. Hammond Valve.
    f. Milwaukee Valve Company.
    g. Watts; a Watts Water Technologies Company.
    h. Zurn Industries, LLC.

2. Pressure Rating: 125 psig minimum unless otherwise indicated.

3. Body: Bronze for NPS 2 and smaller.

4. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

5. Screen: Stainless steel with round perforations unless otherwise indicated.

6. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.020 inch.

7. Drain: Pipe plug.

2.5 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include wall flange with each chrome- or nickel-plated hose bibb.

2.6 WALL HYDRANTS

A. Non-freeze Wall Hydrants (EXT WH):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; Model No. 5509-QT-NB or comparable product by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Prier Products, Inc.
    d. WATTS.
    e. Woodford Manufacturing Company.
    f. Zurn Industries, LLC.

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.

3. Pressure Rating: 125 psig.

4. Operation: Loose key.

5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.

6. Inlet: NPS 3/4 or NPS 1.

7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.

8. Box: Recessed stainless steel, flush mounted with cover.

9. Cover Finish: Polished nickel bronze.

10. Operating Keys(s): One with each wall hydrant.

B. Moderate-Climate Wall Hydrants (INT WH):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; Model No. 5509-QT-SAP-CP or comparable product by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Prier Products, Inc.
    d. WATTS.
    e. Woodford Manufacturing Company.
    f. Zurn Industries, LLC.

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.

3. Pressure Rating: 125 psig.

4. Operation: Loose key.

5. Inlet: NPS 3/4 or NPS 1.

6. Outlet:

   a. Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.

   b. Garden-hose thread complying with ASME B1.20.7.

7. Box: Deep, flush mounted with cover.

8. Box and Cover Finish: Chrome plated.

9. Operating Keys(s): Two with each wall hydrant.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Inc; Model T-585-70-HC or comparable product by one of the following:

   a. Conbraco Industries, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Hammond Valve.
   f. Milwaukee Valve Company.
   g. Red-White Valve Corp.

2. Standard: MSS SP-110 for standard-port, two-piece ball valves.

3. Pressure Rating: 400-psig minimum CWP.

4. Size: NPS 3/4.

5. Body: Copper alloy.

6. Ball: Chrome-plated brass.

7. Seats and Seals: Replaceable.

8. Handle: Vinyl-covered steel.

9. Inlet: Threaded or solder joint.

10. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Stop-and-Waste Drain Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Inc.; S-FP-600-AD-LF or comparable product by one of the following:

   a. Conbraco Industries, Inc.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Standard: MSS SP-110 for ball valves.

3. Pressure Rating: 200-psig minimum CWP or Class 125.

4. Size: NPS 3/4.

5. Body: Lead-free copper alloy or ASTM B 62 bronze.

6. Drain: NPS 1/8 side outlet with cap.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters (WHA "A" through "F"):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; 5200 series "Hydrotrol Junior" or comparable product by one of the following:

   a. AMTROL, Inc.
   b. Josam Company.
   c. MIFAB, Inc.
   d. Precision Plumbing Products.
   e. Sioux Chief Manufacturing Company, Inc.
   f. WATTS.
   g. Zurn Industries, LLC.

2. Standard: ASSE 1010 or PDI-WH 201.

3. Type: Copper tube with multiple "O" ring pistons.

4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.
B. Y-Pattern Strainers: For water, install on supply side of pump.
C. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.

3.2 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.
B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 ADJUSTING

A. Set field-adjustable flow set points of balancing valves.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 22 11 19

SECTION 22 11 23.21 - INLINE, DOMESTIC-WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. In-line circulating pumps.

1.3 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction materials, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. Circulation Pump CP-1.
2. Thermostats.
3. Timers.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For inline, domestic-water pumps to include in operation and maintenance manuals.
B. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.
B. Protect bearings and couplings against damage.
C. Comply with pump manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. UL Compliance: UL 778 for motor-operated water pumps.
C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

2.2 IN-LINE CIRCULATING PUMPS

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. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Corporation.
3. Grundfos Pumps Corp.
4. TACO Incorporated.
5. WILO USA LLC - WILO Canada Inc.

B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, overhung-impeller centrifugal pumps.

C. Capacities and Characteristics: Refer to Schedules on Drawings.

D. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.

2. Minimum Working Pressure: 125 psig.

3. Maximum Continuous Operating Temperature: 220 deg F.

4. Casing: Bronze or stainless steel, with threaded or companion-flange connections.

5. Impeller: Plastic or stainless steel.

6. Motor: Single speed, unless otherwise indicated.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 22 05 13 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 CONTROLS

A. Timers: Electric, for control of hot-water circulation pump.

1. Type: Programmable, seven-day clock with manual override on-off switch.
2. Enclosure: NEMA 250, Type 1, suitable for wall mounting.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: 120-V ac.
6. Programmable Sequence of Operation: Up to two on-off cycles each day for seven days.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.
B. Mount pumps in orientation complying with manufacturer's written instructions.
C. Install thermostats in hot-water return piping.
D. Install timers on wall in Boiler Room.

3.3 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to inline, domestic-water pumps, allow space for service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Section 22 11 19 "Domestic Water Piping Specialties."

E. Install pressure gage and snubber at suction of each pump and pressure gage and snubber at discharge of each pump. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.
B. Connect control wiring between temperature controllers and devices.

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.6 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. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Inline, domestic-water pump will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Check piping connections for tightness.

3. Clean strainers on suction piping.

4. Set timers for automatic starting and stopping operation of pumps.

5. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.

    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.

    c. Verify that pump is rotating in the correct direction.

6. Start motor.

7. Open discharge valve slowly.

8. Adjust temperature settings on thermostats.

9. Adjust timer settings.

3.8 ADJUSTING

A. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.
B. Adjust initial temperature set points.
C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 22 11 23.21

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Heavy-duty, high torque hubless-piping couplings.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Section 01 33 00 "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. CISPI, low torque hubless-piping couplings.
2. Copper pipe and fittings.
3. Transition couplings.

1.4 CLOSEOUT SUBMITTALS

A. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Refer to "Existing Utility Interruptions" paragraph of Section 01 12 00 "Multiple Contract Summary-Project Schedule" for requirements associated with interrupting the existing sanitary sewer service to facilities occupied by the Owner.

1.6 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10 ft. head of water.

2.2 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.
B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings: Centrifugally cast gray cast iron pipe and static cast fittings conforming to requirements of ASTM Standard A 74, service weight (SV) type. Pipe and fittings marked with the collective trademark of the Cast Iron Soil Institute and listed by NSF® International.

C. Gaskets: ASTM C564, rubber.

D. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings: Centrifugally cast gray cast iron pipe and static cast fittings conforming to requirements of ASTM A 888 or CISPI 301. Pipe and fittings marked with the collective trademark of the Cast Iron Soil Institute and listed by NSF® International.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO.
b. Ideal Tridon Group.
c. Mission Rubber Company, LLC; a division of MCP Industries.
d. Tyler Pipe; a subsidiary of McWane Inc.

2. Standards: ASTM C1277 or CISPI 310.

3. Description: Standard stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, neoprene sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Husky SD4000.
b. Clamp All 125.
c. MG Products.

2. Standards: ASTM C1540.

3. Description: Type 304 stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, neoprene sleeve with integral, center pipe stop.

2.5 COPPER TUBE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Apollo Valves; a part of Aalberts Integrated Piping Systems.
2. Cambridge-Lee Industries, LLC.
3. Cerro Flow Products, LLC.
4. Wieland Copper Products, LLC.

B. Copper Type DWV Tube: ASTM B306, drainage tube, drawn temper.

C. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

D. Hard Copper Tube: ASTM B88, Type L and Type M, water tube, drawn temper.

E. Soft Copper Tube: ASTM B88, Type L, water tube, annealed temper.

F. Solder: ASTM B32, lead free with ASTM B813, water-flushable flux.

2.6 TRANSITION FITTINGS

A. Install transition couplings at joints of piping with small differences in OD's. Refer to transition fitting products specified in Section 22 05 00 “Common Work Results for Plumbing”.

2.7 DIELECTRIC FITTINGS

A. Dielectric Unions and Flanges: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined. Comply with requirements in Section 22 05 00 "Common Work Results for Plumbing."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which drainage and vent systems, e.g., storm drainage, sanitary sewer, laboratory waste, etc., are to be installed in coordination with Installer of materials and components specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

1. Verify invert elevation of existing piping when new connections are indicated. Do not install buried sewer work until existing sewer invert elevation has been verified to meet required slope and bury depth requirements of new sewer piping.

2. Determine inverts and routing of piping systems and interferences with other building piping systems, building structure, lights, ductwork, foundations prior to installation.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install vent piping to allow application of insulation within 10 feet of a roof penetration.

I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. 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.

2. Use long-turn, double Y-branch, and 1/8-bend fittings if two fixtures are installed back-to-back or side-by-side with common drainpipe.

    a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.

4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

J. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

K. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: Two percent downward in direction of flow for piping NPS 2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
2. Horizontal Sanitary Waste Piping: Two percent downward in direction of flow.
3. Vent Piping: One percent down toward vertical fixture vent or toward vent stack.

L. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

M. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

N. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

O. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

a. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

2. Install drains in sanitary waste gravity-flow piping.

a. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Insulate vent piping within 10 feet of roof penetrations, all directions.

1. Comply with requirements for insulation specified in Section 22 07 19 " Plumbing Piping Insulation."

R. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.4 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join hubless, cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Join copper tube and fittings with soldered joints in accordance with ASTM B828. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment".

1. Install galvanized carbon-steel pipe hangers for horizontal piping in noncorrosive environments.

2. Install galvanized carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

3. Vertical Piping: MSS Type 8 or Type 42 clamps.

4. Install individual, straight, horizontal piping runs:

a. 100 Ft. and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Ft.: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Ft. if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Ft. or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze.

6. Base of Vertical Piping: MSS Type 52 spring hangers.

B. Install hangers for cast-iron and copper soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical runs of cast-iron and copper soil piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

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 waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.

2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.

4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

5. Comply with requirements for cleanouts and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

6. Equipment: Connect waste piping as indicated.

   a. Provide shutoff valve if indicated and union for each connection.
   b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.
B. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping in accordance with 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.

    a. 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 waste and vent piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

    a. Close openings in piping system and fill with water to point of overflow, but not less than 10 ft. head of water.
    b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    c. 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.

    a. 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.
    b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.
B. Protect sanitary waste and vent piping 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.
D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil, waste and vent piping NPS 3 and smaller are to be any of the following:

1. Service cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI 310, standard hubless-piping couplings; and coupled joints.
3. Copper Type DWV tube, copper drainage fittings, and soldered joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, soil, waste and vent piping NPS 4 and larger are to be any of the following:

1. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Aboveground, soil waste and vent pipe exposed to view in Kitchen areas shall be any of the following:

1. Chrome plated, brass tubing.
2. Stainless-steel pipe and fittings, sealing rings, and gasketed joints.

E. Underground, soil, waste, and vent piping NPS 12 and smaller are to be the following:

1. Service cast-iron soil piping; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 22 13 16

SECTION 22 13 19.13 - SANITARY DRAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Floor drains.
2. Floor sinks.
3. Trench drains.
4. Channel drainage systems.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene styrene.
B. FRP: Fiberglass-reinforced plastic.
C. HDPE: High-density polyethylene.
D. PE: Polyethylene.
E. PP: Polypropylene.
F. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Floor drain "A".
2. Floor sink “A”.
3. Floor sink “B”.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains (FD "A"):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; No. 2005 or a comparable product by one of the following:

   a. Josam Company.
   b. MIFAB, Inc.
   c. WATTS; A Watts Water Technologies Company.
   d. Zurn Industries, LLC.

2. Standard: ASME A112.6.3.

3. Pattern: Floor drain.

4. Body Material: Gray iron.

5. Outlet: Bottom.

6. Backwater Valve: Not required.

7. Top of Body and Strainer Finish: Nickel bronze.

8. Top Shape: Round.

9. Dimensions of Top or Strainer: 7-inch diameter.

10. Top Loading Classification: Light Duty.

11. Trap Material: Cast iron.

12. Trap Pattern: Deep-seal P-trap.

13. Trap Features: Floor drain inline trap seal.

2.3 FLOOR SINKS

A. Cast-Iron Floor Sinks (FS "A"):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; No. 3161-C-11 or a comparable product by one of the following:

   a. Josam Company.
   b. MIFAB, Inc.
   c. WATTS; A Watts Water Technologies Company.
   d. Zurn Industries, LLC.

2. Standard: ASME A112.6.7.

3. Pattern: Floor drain.

4. Body Material: Cast iron 10” deep.

5. Anchor Flange: Not required.

6. Clamping Device: Not required.

7. Outlet: Bottom connection.

8. Coating on Interior Surfaces: Acid-resistant enamel.

9. Sediment Bucket: ABS sediment bucket

10. Internal Strainer: Not required.

11. Top Grate Material: Cast iron.

12. Top of Body and Grate Finish: Nickel bronze less grate.

13. Top Shape: Square.

14. Dimensions of Top Grate: 12 ½” square.

15. Top Loading Classification: No traffic.

16. Funnel: Not required.

B. Cast-Iron Floor Sinks (FS “B”):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; No. 3140-C-12 or a comparable product by one of the following:

   a. Josam Company.
   b. MIFAB, Inc.
   c. WATTS; A Watts Water Technologies Company.
   d. Zurn Industries, LLC.

2. Standard: ASME A112.6.7.

3. Pattern: Floor drain.

4. Body Material: Cast iron 6” deep.

5. Anchor Flange: Not required.

6. Clamping Device: Not required.

7. Outlet: Bottom connection.

8. Coating on Interior Surfaces: Acid-resistant enamel.

9. Sediment Bucket: Not required.

10. Internal Strainer: Aluminum dome bottom strainer.

11. Top Grate Material: Cast iron.

12. Top of Body and Grate Finish: Nickel bronze ½ grate.

13. Top Shape: Square.

14. Dimensions of Top Grate: 12 ½" square.

15. Top Loading Classification: No traffic.

16. Funnel: Not required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.

2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.

3. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

    a. Maintain integrity of waterproof membranes where penetrated.

5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements in Section 22 13 19 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

C. Comply with requirements in Section 22 13 23 "Sanitary Waste Interceptors" for grease interceptors, grease-removal devices, oil interceptors, sand interceptors, and solid interceptors.

D. Install piping adjacent to equipment to allow service and maintenance.

3.3 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 13 19.13

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Roof flashing assemblies.
3. Miscellaneous sanitary drainage piping specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Drain-outlet backwater valves.
2. Floor cleanouts, general building areas.
3. Wall cleanouts.
4. Vent caps.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Section 01 33 00 "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. Deep-seal traps.
2. Inline trap seal device
3. Air-gap fittings.

1.4 CLOSEOUT SUBMITTALS

A. Field quality-control reports.
B. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

2.2 BACKWATER VALVES

A. Drain-Outlet Backwater Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; No. 7080 or a comparable product by one of the following:

a. Josam Company.
b. WATTS; A Watts Water Technologies Company.
c. Zurn Industries, LLC.

2. Size: NPS 2.

3. Body: Cast iron or bronze made for vertical installation.

4. Check Valve: Removable ball float.

5. Inlet: Threaded.

6. Outlet: Threaded or spigot.

2.3 CLEANOUTS

A. Cast-Iron Exposed Cleanouts (CO):

1. Standard: ASME A112.36.2M.
2. Size: Same as connected drainage piping
3. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure: Countersunk or raised-head, brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Floor Cleanouts, General Building Areas (CODP):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg. Co.; Division of Smith Industries, Inc.; No. 4021-U or comparable product by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. WATTS; A Watts Water Technologies Company; Model CO-200-R-6-CF.
    d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for adjustable housing cleanout.

3. Size: Same as connected branch.

4. Type: Adjustable threaded housing.

5. Body or Ferrule: Cast iron.

6. Outlet Connection: Spigot.

7. Closure: Brass plug with tapered threads or plastic plug and gasket.

8. Adjustable Housing Material: Nickel bronze with threads.

9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy with scoriated, vandal resistant top.

10. Frame and Cover Shape: Round

11. Top-Loading Classification: Medium Duty.

12. Riser: ASTM A74, Service Class, cast-iron drainage pipe fitting and riser to cleanout.

C. Wall Cleanouts (COWP):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; No. 4531-U Series or a comparable product by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. WATTS; A Watts Water Technologies Company; Model CO-380-RD.
    d. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.

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, drilled-and-threaded bronze plug and gasket.

6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with vandal resistant screw.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.

2. Size: Same as connected waste piping.

   a. NPS 2: 4-inch-minimum water seal.
   b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

B. Floor-Drain, Inline Trap Seal:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; Quad Close Trap Seal No. 2962 or a comparable product by one of the following:

   a. Green Drain, Inc.
   b. Josam Company.
   c. MIFAB, Inc.
   d. RectorSeal Plumbing; A CSW Industrials Company.

2. Description: Inline floor drain trap seal, forming a physical barrier to slow trap evaporation while not impeding flow from drain.

3. Material: Polymer.

4. Standard: Tested and certified in accordance with ASSE 1072.

5. Listing: ICC-ES or IAPMO listed.

6. Size: Same as floor drain outlet or strainer throat.

C. 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.

D. Vent Caps:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Thaler Metal Industries Ltd; Model VPC Vandalproof Vent Stack Cap with perforated collar or comparable product by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation

2. Description: Vandal-proof, .064" mill finish 1100 0T alloy aluminum vent stack cap with perforated collar, supporting cross member secured with vandal resistant stainless steel mounting screws.

3. Size: Same as connected stack vent or vent stack.

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. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install deep-seal traps on floor drains and other waste outlets, if indicated.

E. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

F. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

G. Install vent caps on each vent pipe passing through roof.

H. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 PIPING CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 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 13 19

SECTION 22 13 23 - SANITARY WASTE INTERCEPTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Grease interceptors.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.
B. PP: Polypropylene.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of interceptor. Include materials of fabrication, dimensions, rated capacities, retention capacities, operating characteristics, size and location of each pipe connection, furnished specialties, and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sanitary waste interceptors to include in emergency, operation, and maintenance manuals.

1.6 FIELD CONDITIONS

A. Interruption of Existing Sewer Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sewer services according to requirements indicated:

1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of service.
2. Do not proceed with interruption of sewer services without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 GREASE INTERCEPTORS

A. Cast-Iron or Steel Grease Interceptors GI-B-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; Model 8460 or a comparable product by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. WATTS; A Watts Water Technologies Company.
    d. Zurn Industries, LLC.

2. Standard: PDI G101, for intercepting and retaining FOG from food-preparation wastewater.

3. PDI Seal: Required.

4. Body Material: Cast iron or steel.

5. Interior Lining: Corrosion-resistant enamel.

6. Exterior Coating: Corrosion-resistant enamel.

7. Capacities and Characteristics: As scheduled on the drawings

    a. Mounting: Recessed, flush with floor.
    b. Flow-Control Fitting: Required.
    c. Operation: Manual cleaning.

2.2 LABELING AND IDENTIFYING

A. Grease Interceptor Warning Sign: Refer to Section 22 05 53 "Identification for Plumbing Piping and Equipment" for warning signs and basic installation requirements.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.2 INSTALLATION

A. Equipment Mounting:

1. Install grease interceptors on cast-in-place concrete equipment base(s).
2. Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."

B. Set interceptors level and plumb.

C. Set interceptors level and plumb.

D. Set tops of metal interceptor covers flush with finished surface in pavements.

E. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

3.3 PIPING CONNECTIONS

A. Piping installation requirements are specified in Section 22 13 16 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
B. Make piping connections between interceptors and piping systems.

3.4 IDENTIFICATION

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Grease interceptors.

3.5 PROTECTION

A. Protect sanitary waste interceptors from damage during construction period.
B. Repair damage to adjacent materials caused by sanitary waste interceptor installation.

END OF SECTION 22 13 23

SECTION 22 14 14 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Heavy-duty, high torque hubless-piping couplings.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the "As-Specified Verification Form" (attached to Section 01 33 00 "Submittal Procedures") for each item listed below; otherwise submit full Product Data for the following:

1. CISPI, standard hubless-piping couplings.
2. Transition couplings.
3. Service saddles.

1.4 CLOSEOUT SUBMITALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10 ft. head of water.

2.2 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.
B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings: Centrifugally cast gray cast iron pipe and static cast fittings conforming to requirements of ASTM Standard A 74, service weight (SV) type. Pipe and fittings marked with the collective trademark of the Cast Iron Soil Institute and listed by NSF® International.

C. Gaskets: ASTM C564, rubber.

D. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings: Centrifugally cast gray cast iron pipe and static cast fittings conforming to requirements of ASTM A 888 or CISPI 301. Pipe and fittings marked with the collective trademark of the Cast Iron Soil Institute and listed by NSF® International.

C. CISPI, Standard Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ANACO.
   b. Ideal Tridon Group.
   c. Mission Rubber Company, LLC; a division of MCP Industries.
   d. Tyler Pipe; a subsidiary of McWane Inc.

2. Standards: ASTM C1277 or CISPI 310.

3. Description: Standard stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Huky SD 4000.
   b. Clamp All 125.
   c. MG Products.

2. Standards: ASTM C1540.

3. Description: Type 304 stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 TRANSITION FITTINGS

A. Install transition couplings at joints of piping with small differences in OD's. Refer to transition fitting products specified in Section 22 05 00 “Common Work Results for Plumbing”.

2.6 DIELECTRIC FITTINGS

A. Dielectric Unions and Flanges: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined. Comply with requirements in Section 22 05 00 "Common Work Results for Plumbing."

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.

2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

a. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

K. Install piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm Drainage Piping: 1 percent downward in direction of flow.

L. 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."

M. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping.

    a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
    b. Comply with requirements for cleanouts specified in Section 22 14 23 "Storm Drainage Piping Specialties."

2. Install drains in storm drainage gravity-flow piping.

    a. Comply with requirements for drains specified in Section 22 14 23 "Storm Drainage Piping Specialties."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

O. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Drainage Piping: Unshielded, nonpressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.

2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

3. Vertical Piping: MSS Type 8 or Type 42, clamps.

4. Install individual, straight, horizontal piping runs:

   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3: 60 inches with 1/2-inch rod.
2. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
3. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

E. Install supports for vertical cast-iron soil piping every 15 feet.

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanout and drains specified in Section 22 14 23 "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed storm drainage piping.
B. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

a. 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.

    a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

    a. Test storm drainage piping on completion of roughing-in.

    b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

5. Prepare reports for tests and required corrective action.

C. Piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.
B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, storm drainage piping NPS 4 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Underground storm drainage piping shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 22 14 13

SECTION 22 14 23 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.
4. Flashing materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Cast-iron, large-sump, general-purpose roof drains.
2. Drain-outlet backwater valves.
3. Floor cleanouts, general building areas.
4. Wall cleanouts.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains (RD "**A**"):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg. Co.; Division of Smith Industries, Inc.; No. 1015Y-R-C-U-G or comparable product by one of the following:

a. Josam Company.
b. MIFAB, Inc.
c. WATTS; A Watts Water Technologies Company; No. RD-300-AE-B-D-K80-L.
d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.4, for general-purpose roof drains.

3. Body Material: Cast iron.

4. Dimension of Body: Nominal 16-inch diameter.

5. Combination Flashing Ring and Gravel Stop: Required.

6. Outlet: Bottom.

7. Extension Collars: Adjustable required.

8. Underdeck Clamp: Required.

9. Sump Receiver Plate: Required.

10. Dome Material: Galvanized Cast Iron.

11. Vandal-Proof Dome: Required.

2.2 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Drain-Outlet Backwater Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg. Co.; Division of Smith Industries, Inc.; No. 7080 or comparable product by one of the following:

   a. Josam Company.
   b. MIFAB, Inc.
   c. WATTS; A Watts Water Technologies Company; Model BV-300.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Size: Same as floor drain outlet or storm drain.

3. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain or in vertical storm leader for condensate connection.

4. Check Valve: Removable ball float.

5. Inlet: Threaded.

6. Outlet: Threaded or spigot.

2.3 CLEANOUTS

A. Exposed Metal Cleanouts (CO):

1. Vertical 6 NPS and Smaller:

a. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
b. Size: Same as connected drainage piping
c. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or hubless, cast-iron soil pipe test tee as required to match connected piping.
d. Closure: Countersunk or raised-head, brass plug.
e. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

2. 8-inch Pipe Size and Larger: Cast bronze tapered plug with tapped test tee cast iron fitting.

3. Horizontal: All Pipe Sizes: Cast iron Tee "Y" fitting with tapped spigot ferrule and cast bronze taper thread plug.

B. Floor Cleanouts (CODP):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg. Co.; Division of Smith Industries, Inc.; No. 4021-U or comparable product by one of the following:

a. Josam Company.
b. MIFAB, Inc.
c. WATTS; A Watts Water Technologies Company; Model CO-200-R-6-CF.
d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M, for adjustable housing cleanouts.

3. Size: Same as connected branch.

4. Type: Adjustable housing.

5. Body or Ferrule Material: Cast iron.

6. Outlet Connection: Spigot.

7. Closure: Brass plug with straight threads and gasket or plastic plug and gasket.

8. Adjustable Housing Material: Nickel-bronze with threads.

9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy with scoriated, vandal resistant top.

10. Frame and Cover Shape: Round.

11. Top-Loading Classification: Medium Duty.

12. Carpet Clamping Collar: Required in carpeted areas.

13. Riser: ASTM A 74, Extra-Heavy or Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Wall Cleanouts (COWP):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg. Co.; Division of Smith Industries, Inc.; No. 4531-U or comparable product by one of the following:

a. Josam Company.
b. MIFAB, Inc.
c. WATTS; A Watts Water Technologies Company; Model CO-380-RD.
d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.

3. Size: Same as connected drainage piping.

4. Body Material: Hubless, cast-iron soil-pipe test tee as required to match connected piping.

5. Closure: Countersunk, drilled-and-threaded bronze plug and gasket.

6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with vandal resistant screw.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of storm drainage piping systems to verify actual locations of specialties installations.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

B. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install drain-outlet backwater valves in condensate connections to vertical conductors.

F. Install test tees in vertical conductors and near floor.

G. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

H. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 14 13 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.4 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of 6.0-lb/sq. ft. lead sheets, 0.0938-inch thickness or thicker. Solder joints of 4.0-lb/sq. ft. lead sheets, 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching the pipe size, with a minimum length of 10 inches and with skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

3.5 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 22 16 23 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. An example includes rooftop locations.

C. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Piping specialties.
2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Dielectric fittings.

1.5 CLOSEOUT SUBMITTALS

A. Field Quality-Control Submittals:

1. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Steel Support Welding: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. Pipe Welding: Qualify procedures and operators in accordance with the ASME Boiler and Pressure Vessel Code.

B. Regulatory Requirements: Install gas equipment, piping materials and provide testing in accordance with Fuel Gas Code of New York State, applicable American National Standards Institute (ANSI) code and NFPA 54 - National Fuel Gas Code, and rules and regulations of local gas company.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping in accordance with requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating and protect from direct sunlight.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Natural-Gas Service: Refer to “Existing Utility Interruptions” paragraph of Section 01 12 00 “Multiple Contract Summary-Project Schedule” for requirements associated with interrupting the existing natural gas supply to facilities occupied by the Owner.

1.9 COORDINATION

A. Coordinate requirements for access panels and doors for valves installed and concealed behind finished surfaces. Comply with requirements in Section 08 31 13 "Access Doors and Frames."
B. Coordinate requirements for piping identification for natural-gas piping. Comply with requirements in Section 22 05 53 "Identification of Plumbing Piping and Equipment."

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each product type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Comply with the Fuel Gas Code of New York State.

B. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.

C. Natural-Gas System Pressure within Buildings:

1. Single Pressure: 0.5 psig or less.

2.3 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A53/A53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.

3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

4. Mechanical Couplings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Dresser Piping Specialties; Division of Dresser, Inc.
2) Smith-Blair, Inc.

b. Stainless steel flanges and tube with epoxy finish.

c. NBR seals.

d. Stainless steel bolts, washers, and nuts.

e. Coupling is to be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

f. Steel body couplings installed underground on plastic pipe are to be factory equipped with anode.

2.4 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.
B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.5 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.

2. Threaded Ends: Comply with ASME B1.20.1.

3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.

4. Tamperproof Feature: Locking feature for valves indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.

5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.

6. Service Mark: Valves NPS 1-1/4 to NPS 2 having initials "WOG" permanently marked on valve body.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.

2. Flanged Ends: Comply with ASME B16.5 for steel flanges.

3. Tamperproof Feature: Locking feature for valves indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.

4. Service Mark: Initials "WOG" permanently marked on valve body.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; Model T-585-70-UL or comparable product by one of the following:

a. BrassCraft Manufacturing Company; a Masco company.
b. Conbraco Industries, Inc.; Apollo Div.
c. Lyall, R. W. & Company, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B584.

3. Ball: Chrome-plated bronze.

4. Stem: Bronze; blowout proof.

5. Seats: Reinforced TFE; blowout proof.

6. Packing: Threaded-body packnut design with adjustable-stem packing.

7. Ends: Threaded, flared, or socket as indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.

8. CWP Rating: 600 psig.

9. Listing: Valves NPS 1 and smaller are to be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A.Y. McDonald Mfg. Co.
    b. Flowserve Corporation.
    c. Homestead Valve, a division of Olson Technologies, Inc.
    d. Milliken Valve Company; a Mueller brand.
    e. Mueller Co.
    f. R & M Energy Systems; Robbins & Myers.

2. Body: Cast iron, complying with ASTM A126, Class B.

3. Plug: Bronze or nickel-plated cast iron.

4. Seat: Coated with thermoplastic.

5. Stem Seal: Compatible with natural gas.

6. Ends: Threaded or flanged as indicated in "Underground, Manual Gas Shutoff Valve Schedule" and "Aboveground, Manual Gas Shutoff Valve Schedule" articles.

7. Operator: Square head or lug type with tamperproof feature where indicated.

8. Pressure Class: 125 psig.

9. Listing: Valves NPS 1 and smaller are to be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined. Refer to Section 22 05 00 "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

2.7 LABELING AND IDENTIFYING

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."
B. Paint: Refer to Section 09 96 00 "High-Performance Coatings" for interior and exterior natural-gas piping paint materials and basic installation requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
B. Inspect natural-gas piping according to Fuel Gas Code of New York State to determine that natural-gas utilization devices are turned off in piping section affected.
C. Comply with Fuel Gas Code of New York State requirements for prevention of accidental ignition.

3.3 INSTALLATION OF OUTDOOR PIPING

A. Comply with Fuel Gas Code of New York State for installation and purging of natural-gas piping.

3.4 INSTALLATION OF INDOOR PIPING

A. Comply with Fuel Gas Code of New York State for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Do not install piping in concealed locations unless sleeved with the sleeve open at both ends.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Where installing piping above accessible ceilings, allow sufficient space for ceiling panel removal.

G. Locate valves for easy access. Do not locate valves within return air plenums.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Verify final equipment locations for roughing-in.

K. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

L. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

M. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

O. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

a. Exception: Tubing passing through partitions or walls does not require striker barriers.

2. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

b. Do not install natural-gas piping in solid walls or partitions.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

S. Do not use natural-gas piping as grounding electrode.

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.5 INSTALLATION OF VALVES

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
B. Do not install valves in return-air plenums.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints in accordance with AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.7 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment" for hangers, supports, and anchor devices.

B. Install hangers for steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

D. Support horizontal piping within 12 inches of each fitting.

E. Support vertical runs of steel piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.8 PIPING CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous and bonded to gas-appliance equipment grounding conductor of the circuit powering the appliance in accordance with NFPA 70.

C. Where installing piping adjacent to appliances, allow space for service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

3.9 LABELING AND IDENTIFICATION

A. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 PAINTING

A. Comply with requirements in Section 09 96 00 “High-Performance Coatings” for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components with factory-applied paint or protective coating.

C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components with factory-applied paint or protective coating.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Test, inspect, and purge natural gas according to Fuel Gas Code of New York State and authorities having jurisdiction.

    a. Isolate appliances and equipment prior to conducting pressure test.

    b. The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used.

    c. Leave pipe joints, including welds, exposed for examination during the test.

    d. Isolate the source of pressure before the pressure tests are made.

    e. Measure test pressure with a manometer or with a pressure-measuring device designed and calibrated to read, record or indicate a pressure loss caused by leakage during the pressure test period. Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than five times the test pressure.

    f. Pressure test piping to no less than 1-1/2 times the proposed maximum working pressure, but not less than 30-psig irrespective of delivered gas pressure, for a duration of 2 hours.

B. Natural-gas piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping NPS 2 and smaller shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.13 INDOOR PIPING SCHEDULE

A. Aboveground, branch piping NPS 2 and smaller shall be the following:

1. ASTM A53-steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping NPS 2 and smaller shall be one of the following:

1. ASTM A53 steel pipe with malleable-iron fittings and threaded joints.
2. ASTM A53 steel pipe with wrought-steel fittings and welded joints.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger shall be the following:

1. Cast-iron, non-lubricated plug valve.

END OF SECTION 22 16 23

SECTION 22 42 13.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Water closets.
2. Supports
3. Flushometer valves.
4. Toilet seats.

1.3 DEFINITIONS

A. Effective Flush Volume: Average of two reduced flushes and one full flush per fixture.
B. WaterSense Fixture: Water closet and/or flushometer valve/tank certified by the EPA to meet the WaterSense performance criteria.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1. Water Closet “A” flushometer valves.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the “As-Specified Verification Form” (attached to Section 01 33 00 “Submittal Procedures”) for each item listed below; otherwise submit full Product Data for the following:

1. Water Closet “A” bowl.
2. Supports
3. Toilet seats.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.7 MAINTENANCE MATERIALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

1.8 QUALITY ASSURANCE

A. Water Conservation:

1. Provide plumbing fixtures complying with applicable provisions of Section 604.4 of the Plumbing Code of New York State.

B. Regulatory Requirements: Comply with requirements in 36 CFR Part 1191 – “Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines"; for plumbing fixtures for people with disabilities.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

1. Comply with ASME A112.19.2/CSA B45.1 for water closets.
2. Comply with ASME A112.19.5/CSA B45.15 for flush valves and spuds for water closets and tanks.
3. Comply with ASSE 1037/ASME A112.1037/CSA B125.37 for flush valves.
4. Comply with IAMPO/ANSI Z124.5 for water-closet (toilet) seats.
5. Comply with ASME A112.6.1M for water-closet supports.
6. Comply with ICC A117.1 for ADA-compliant water closets.
7. Comply with ASTM A1045 for flexible PVC gaskets used in connection of vitreous china water closets to sanitary drainage systems.
8. Comply with ASME A112.4.3 for plastic fittings used in connection of vitreous china water closets to sanitary drainage systems.
9. Comply with ASME A112.18.6 for braided or corrugated stainless-steel flexible hose.

B. Source Limitations: Obtain water closet fixtures, flushometers and accessories from single source from single manufacturer.

2.2 GENERAL CHARACTERISTICS

A. Vitreous China: Unmarked, true and level, clear, smooth and bright. Warranted not to craze, color or scale.
B. Trap ways no less than 2-1/8 inches in diameter and fully glazed.
C. Water surface area no less than 10 inches x 12 inches (254 by 305 mm).
D. 100 percent factory tested for hydraulic performance, and trap seal depth, meeting or exceeding ANSI/ASME Standard A112.19.6, CSA B45 and a minimum ball pass diameter of 2 inches.

2.3 WALL-MOUNTED WATER CLOSETS

A. Water Closets (WC "A"): Wall mounted, top spud.

1. Basis-of-Design Product: Subject to compliance with requirements, provide American Standard; Afwall Millennium FloWise Elongated No. 3351.101 or comparable product by one of the following:

    a. Kohler Co.
    b. Sloan Valve Company.
    c. Zurn Industries, LLC.

2. Bowl:

    a. Material: Vitreous china.
    b. Type: Siphon jet.
    c. Style: Flushometer valve.
    d. Height: Refer to Plumbing Fixture Schedule on Drawings.
    e. Rim Contour: Elongated.
    f. Water Consumption: 1.1 gal. – 1.6 gal. per flush.
    g. Effective Flush Volume: 1.28 gal. per flush.
    h. Spud Size and Location: NPS 1-1/2; top.
    i. Outlet: Back.
    j. Color: White.

3. Support: Comply with requirements in "Support" Article.

4. Flushometer Valve: Battery-Powered, Dual Flush, Flushometer Valves. Comply with requirements in "Flushometer Valve" Article.

5. Toilet Seat: Standard Toilet Seat. Comply with requirements in "Toilet Seat" Article.

2.4 FLUSHOMETER VALVES

A. Battery-Powered, Dual Flush Flushometer Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sloan Valve Company; Sloan ECOS Model No. ECOS 8111-1.6/1.1-YO-YB or comparable product by the following:

    a. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Minimum Pressure Rating: 125 psig.

3. Features: Include angle stop bumper, sweat solder adapter, cast set screw escutcheon, casing tube, integral check stop and backflow-prevention device.

4. Material: Brass body with corrosion and chloramine resistant components.

5. Exposed Flushometer-Valve Finish: Chrome plated.

6. Actuator: Solenoid complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

7. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

8. Consumption: 1.6 gal./ 1.1 gal. (4.2 liter) per flush.

9. Effective Flush Volume: 1.28 gal. per flush.

10. Minimum Inlet: NPS 1.

11. Minimum Outlet: NPS 1-1/4.

2.5 TOILET SEATS

A. Standards Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Standard.
    b. Bemis Manufacturing Company.
    c. Church Seats; Bemis Manufacturing Company.
    d. Kohler Co.
    e. ProFlo; a Ferguson Enterprises, Inc. brand.
    f. Zurn Industries, LLC.

2. Material: Anti-microbial treated fire-retardant plastic.

3. Type: Commercial (Heavy duty).

4. Shape: Elongated rim, open front.

5. Hinge: Self-sustaining, check.

6. Hinge Material: Stainless steel.

7. Seat Cover: Not required.

8. Color: White.

2.6 SUPPORTS

A. Water Closet Carrier:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg.; Series 100 and Series 200 M51 or comparable product by one of the following:

   a. Josam Company.
   b. Zurn Industries, LLC.

2. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

   a. Provide horizontal carrier fittings with NPS 2 auxiliary no-hub inlet where appropriate for other plumbing fixture vertical pipe connections.

      1) Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg.; Series 209 and Series 219 M51 or comparable product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
B. Examine walls and floors for suitable conditions where water closets will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
5. Measure support height installation from finished floor, not structural floor.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.

2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.

3. Install flushometer valves for accessible water closets such that the operating handle faces the approach or transfer side of the water closet stall. Install sensor operated flushometer valves in the same manner so that, in the event that the sensor operated flushometer valve is replaced by a manually operated valve, the handle will comply with the above requirement.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
2. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
3. Install escutcheon so set screw is facing floor.

F. Joint Sealing:

1. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."
2. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
3. Match sealant color to water-closet color.

3.3 PIPING CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."
D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
B. Adjust water pressure at flushometer valves to produce proper flow.
C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
B. Install protective covering for installed water closets and fittings.

END OF SECTION 22 42 13.13

SECTION 22 42 16.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.
3. Supplies.
4. Drains.
5. Traps.
6. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. Lavatory “A” faucets.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the “As-Specified Verification Form” (attached to Section 01 33 00 “Submittal Procedures”) for each item listed below; otherwise submit full Product Data for the following:

1. Lavatory “A” bowls.
2. Supply fittings.
3. Offset tailpiece drains.
4. Standard traps.
5. Supports

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1.4 MAINTENANCE MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

1.5 QUALITY ASSURANCE

A. Water Conservation:

1. Provide plumbing fixtures complying with applicable provisions of Section 604.4 of the Plumbing Code of New York State.

B. Regulatory Requirements: Comply with requirements in 36 CFR Part 1191 – “Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines"; for plumbing fixtures for people with disabilities.

1.6 FIELD CONDITIONS

A. Comply with “Project/Site Conditions” article in Part 1 of Section 22 05 00 “Common Work Results for Plumbing” for lead testing requirements prior to commencing any work.
B. Coordinate potable water lead testing with Owner prior to starting any construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Lavatory faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Source Limitations: Obtain lavatory fixtures, faucets and accessories from single source from single manufacturer.

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory **(**LAV “A): Vitreous china, wall mounted, accessible with back.

1. Basis-of-Design Product: Subject to compliance with requirements, provide American Standard America; Lucerne No. 0356.015 or comparable product by one of the following:

a. Kohler Co.
b. Sloan Valve Company.
c. Zurn Industries, LLC.

2. Fixture:

   a. Standard: ASME A112.19.2/CSA B45.1.
   b. Type: For wall hanging.
   c. Nominal Size: Rectangular, 20 by 18 inches.
   d. Faucet-Hole Punching: Three holes, 4-inch centers.
   e. Faucet-Hole Location: Top.
   f. Color: White.
   g. Mounting Material: Chair carrier.

3. Faucet: Manual-type, two-handle metering, centerset commercial, solid-brass valve. Comply with requirements in “Lavatory Faucet” Article.

4. Water-Temperature Limiting Device: Comply with requirements for temperature-actuated, water mixing valves specified in Section 22 11 19 "Domestic Water Piping Specialties" and as scheduled on Drawings.

5. Supplies: Comply with requirements in “Supply Fittings” Article.

6. Drain: Offset Tailpiece. Comply with requirements in “Drain” Article.

7. Trap: Standard Trap. Comply with requirements in “Trap” Article.

8. Support: Comply with requirements in “Support” Article.

2.3 MANUALLY OPERATED LAVATORY FAUCETS

A. Lavatory faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372, or be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI) accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Lavatory Faucets: Manual-type, two-handle metering, centerset commercial, solid-brass valve.

1. Basis-of-Design Product: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Chicago Faucets; MVP Commercial Faucet No. 802-V665CP.
   b. Delta Faucet Company; Commercial Faucet No. 86T1153.
      MOEN M-PRESS COMMERCIAL FAUCET NO. 8886.
   c. Zurn Industries, LLC; Commercial Brass and Fixtures; AquaSpec Faucet No. Z86500.

2. Standard: ASME A112.18.1/CSA B125.1.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.

4. Body Type: Centerset, with 4” centers.

5. Body Material: Commercial, solid brass.

6. Finish: Polished chrome plate.

7. Maximum Flow: 0.25 gal. per metering cycle.

8. Mounting Type: Deck, exposed.

9. Valve Handle(s): Push button.

10. Spout: Rigid type.

11. Spout Outlet: Aerator.

12. Operation: Compression, manual.

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Basis-of-Design Product: Subject to compliance with requirements, provide McGuire Manufacturing, Inc., or comparable product by one of the following:

1. American Standard America.
2. Zurn Industries, LLC; Commercial Brass and Fixtures.

C. Standard: ASME A112.18.1/CSA B125.1.

D. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass escutcheon with set screw.

E. Supply Stops: Basis-of-Design: No. LFHST02LKSB chrome-plated-brass, compression valve with inlet connection matching supply piping.

1. Operation: Loose key.

F. Risers: ASME A112.18.6/CSA B125.6, braided-stainless steel, flexible hose riser.

1. NPS 3/8.

2.5 DRAINS

A. Offset Tailpiece:

1. Basis-of-Design Product: Subject to compliance with requirements, provide McGuire Manufacturing, Inc.; No. 155-WC or comparable product by one of the following:

a. American Standard America
b. Zurn Industries, LLC; Commercial Brass and Fixtures.

B. Standard: ASME A112.18.2/CSA B125.2.

C. Drain: Grid type with NPS 1-1/4 tailpiece.

2.6 TRAPS

A. Standard Trap:

1. Basis-of-Design Product: Subject to compliance with requirements, provide McGuire Manufacturing, Inc.; No. 8902-F or comparable product by one of the following:

a. American Standard America.
b. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow, 17 gauge brass tube to wall with cleanout plug. Include chrome-plated brass escutcheon with set screw.

2.7 LAVATORY SUPPORTS

A. Lavatory Carrier:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Mfg Co; a division of Morris Group International; Series No. 700-M31 or a comparable product by one of the following:

a. MIFAB, Inc.
b. WATTS; A Watts Water Technologies Company.
c. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.
B. Examine counters and walls for suitable conditions where lavatories will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install lavatories level and plumb in accordance with roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Measure support height installation from finished floor, not structural floor.

D. Install water-supply piping with stop on each supply to each lavatory faucet. Install stops in locations that are accessible for ease of operation.

E. Install trap and waste piping on each drain outlet of each lavatory to be connected to sanitary drainage system.

F. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, in accordance with ICC A117.1.

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

H. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

I. Install protective shielding enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 FIELD QUALITY CONTROL

A. Comply with "Field Quality Control" article in Part 3 of Section 22 05 00 "Common Work Results for Plumbing" for lead testing requirements prior to commencing any work.

B. Inspecting Agency: Engage a qualified laboratory to perform lead testing on all potable water faucets installed under this contract and used or potentially used for drinking or cooking purposes according to NYS Law 10 CRR-NY 67-4.1. Submit test results Owner and the Architect.

C. Replace any faucet that exceeds the lead action level (5 micrograms per liter) and coordinate with the Owner for retesting until satisfactory results are obtained.

3.5 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

3.6 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.
B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
C. Provide protective covering for installed lavatories and fittings.

END OF SECTION 22 42 16.13

SECTION 22 42 16.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service sinks.
2. Sinks.
3. Sink faucets.
4. Supply fittings.
5. Waste fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks. Include rated capacities, operating characteristics and furnished specialties and accessories.

a. Mop receptor faucet.
b. Sink “A” faucet.
c. Sink “B” faucet.

B. As-Specified Data: If the product to be incorporated in the Work is as specified by manufacturer name and product designation in this Specification Section, submit the “As-Specified Verification Form” (attached to Section 01 33 00 “Submittal Procedures”) for each item listed below; otherwise submit full Product Data for the following:

1. Mop receptor “A”.
2. Mop receptor accessories.
3. Sink “A” bowl.
4. Sink “B” bowl.
5. Supply Fittings.
6. Offset Drain Fitting.
7. Sink Traps.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted sinks.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sinks and accessories to include in maintenance manuals.

1.6 MAINTENANCE MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

1.7 QUALITY ASSURANCE

A. Water Conservation:

1. Provide plumbing fixtures complying with applicable provisions of Section 604.4 of the Plumbing Code of New York State, including the 2017 Uniform Code Supplement.

B. Regulatory Requirements: Comply with requirements in 36 CFR Part 1191 – "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines"; for plumbing fixtures for people with disabilities.

1.8 FIELD CONDITIONS

A. Comply with "Project/Site Conditions" article in Part 1 of Section 22 05 00 "Common Work Results for Plumbing" for lead testing requirements prior to commencing any work.
B. Coordinate potable water lead testing with Owner prior to starting any construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sink faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Source Limitations: Obtain sink fixtures, faucets and accessories from single source from single manufacturer.

2.2 SERVICE BASINS

A. Mop Receptor (MR "A"): Plastic, floor mounted.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Crane Plumbing, L.L.C.; Fiat Model No. MSB3624 or comparable product by one of the following:

a. Ferguson Enterprises, Inc.; ProFlo Brand.
b. Florestone Products Co., Inc.
c. Mustee, E. L., & Sons, Inc.
d. Swan Corporation (The).
e. Zurn Industries, LLC; Light Commercial Specialty Plumbing Products.

2. Fixture:

a. Standard: CSA B45.5/IAPMO Z124.
b. Material: Molded polymer.
c. Nominal Size: 36 by 24 by 10 inches.
d. Tiling Flange: Not required.
e. Rim Guard: On front top surfaces.
f. Drain: Stainless steel, flat grid drain body with NPS 3 outlet.

3. Mounting: On floor and flush to wall.

B. Accessories:

1. Faucet: Comply with requirements in "Sink Faucet" Article.

2. Hose and hose bracket; 5 by 3 inches stainless steel bracket with rubber grips. 30 inch long flexible heavy duty 5/8 inch rubber hose, cloth reinforced with 3/4 inch chrome coupling at one end. Similar to "No. 832-AA" by Fiat.

3. Mop hanger bracket; 24 by 3 inches, stainless steel with three (3) rubber grips. Similar to "No. 889-CC."

2.3 SINKS

A. Sink "A": Standard stainless steel, counter mounted, accessible.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay Manufacturing Co; Model No. LRAD2521-55 or comparable product by one of the following:

a. Advance Tabco.
b. Eagle Group; Foodservice Equipment Division.
c. Griffin Products, Inc.
d. Just Manufacturing.

2. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4.

   b. Type: Ledge back.

   c. Number of Compartments: One.

   d. Overall Dimensions: 25 by 21.25 inches.

   e. Metal Thickness: 18 gauge / 0.050 inch.

   f. Material: Type 304 stainless steel with fully undercoated underside.

   g. Compartment:

      1) Dimensions: 21 by 15.75 by 5.5 inches.
      2) Drain: 3.5 inch opening.
      3) Drain Location: Centered, near back of compartment.

3. Faucet(s): Accessible manual type, single-control mixing valve with swing spout. Comply with requirements in “Sink Faucet” Article.

   a. Number Required: One.
   b. Mounting: On sink fixture ledge, in hole(s) provided.

4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.

5. Waste Fittings: Offset Drain Fitting. Comply with requirements in "Drains" Article.

6. Traps: Sink Trap. Comply with requirements in "Traps" Article.

7. Mounting: On counter with manufacturer recommended sealant.

B. Sink “B”: Large stainless steel, counter mounted, accessible.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay Manufacturing Co; Model No. LRAD 3122-55 or comparable product by one of the following:

   a. Advance Tabco.
   b. Eagle Group; Foodservice Equipment Division.
   c. Griffin Products, Inc.
   d. Just Manufacturing.

2. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4.

   b. Type: Ledge back.

   c. Number of Compartments: One.

d. Overall Dimensions: 31 by 22 inches.

e. Metal Thickness: 18 gauge / 0.050 inch.

f. Material: Type 304 stainless steel with fully undercoated underside.

g. Compartment:

1) Dimensions: 28 by 16 by 5.5 inches.
2) Drain: 3.5 inch opening.
3) Drain Location: Centered, near back of compartment.

3. Faucet(s): Accessible, manual type, two-lever-handle mixing valve with restricted swing spout Comply with requirements in “Sink Faucet” Article.

a. Number Required: One.
b. Mounting: On sink fixture ledge, in hole(s) provided.

4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.

5. Waste Fittings: Offset Drain Fitting. Comply with requirements in "Drains" Article.

6. Traps: Sink Trap Comply with requirements in "Traps" Article.

7. Mounting: On counter with manufacturer recommended sealant.

2.4 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Mop Receptor Faucets: Manual type, two-lever-handle mixing valve.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Speakman Company: Model No. SC-5811 or comparable product by one of the following:

a. Chicago Faucets.
b. Delta Faucet Company.
c. GROHE America, Inc.
d. Just Manufacturing.
e. Moen Incorporated.
f. T & S Brass and Bronze Works, Inc.
g. Zurn Plumbing Products Group.

2. Standard: CSA/ASSE-1001.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.

4. Body Type: Widespread.

5. Body Material: Commercial, solid brass.

6. Finish: Polished chrome plate.

7. Maximum Flow Rate: 10 gpm hot- and cold-water full open at 40 psig

8. Handle(s): Cross, four arm.

9. Mounting Type: Back/wall, exposed.

10. Spout Type: Rigid, solid brass with wall brace.

11. Vacuum Breaker: Required for hose outlet.

12. Spout Outlet: Hose thread according to ASME B1.20.7.

13. Integral Stops: Required.

C. Sink Faucets: Accessible manual type, single-control mixing valve with swing spout.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay Manufacturing Co; Model LK1000CR or comparable product by one of the following:

a. American Standard America.
b. Bradley Corporation.
c. Chicago Faucets.
d. Delta Faucet Company.
e. Elkay Manufacturing Co.
f. GROHE America, Inc.
g. Just Manufacturing.
h. Kohler Co.
i. Moen Incorporated.
j. Speakman Company.
k. T & S Brass and Bronze Works, Inc.
l. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASME A112.18.1/CSA B125.1.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.

4. Body Type: Widespread.

5. Body Material: General-duty, solid brass.

6. Finish: Chrome plated.

7. Maximum Flow Rate: 1.5 gpm.

8. Handle(s): Lever.

9. Mounting Type: Deck, exposed.

10. Spout Type: Swing, shaped tube.

11. Spout Outlet: Aerator.

D. Sink Faucets: Manual type, two-lever-handle mixing valve with restricted swing spout.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay Manufacturing Co; Model LKD2439C or comparable product by one of the following:

a. American Standard America.
b. Bradley Corporation.
c. Chicago Faucets.
d. Delta Faucet Company.
e. Elkay Manufacturing Co.
f. GROHE America, Inc.
g. Just Manufacturing.
h. Kohler Co.
i. Moen Incorporated.
j. Speakman Company.
k. T & S Brass and Bronze Works, Inc.
l. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASME A112.18.1/CSA B125.1.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.

4. Body Type: Widespread.

5. Body Material: General-duty, solid brass.

6. Finish: Chrome plated.

7. Maximum Flow Rate: 2.2 gpm.

8. Handle(s): Accessible levers.

9. Mounting Type: Deck, exposed.

10. Spout Type: Restricted swing (45° each side of center), round tubular arc spout. Requires spout kit #000000685.

11. Spout Outlet: Aerator.

2.5 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Basis-of-Design Product: Subject to compliance with requirements, provide McGuire Manufacturing, Inc. No. LF2167-F or comparable product by one of the following:

1. American Standard America
2. Zurn Industries, LLC; Commercial Brass and Fixtures.

C. Standard: ASME A112.18.1/CSA B125.1.

D. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass escutcheon with set screw.

E. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

F. Operation: Wheel handle.

G. Risers:

1. NPS 1/2.
2. ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.6 DRAINS

A. Offset Drain Fitting:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay Manufacturing Co No. LK35L or comparable product by one of the following:

a. Just Manufacturing.
b. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASME A112.18.2/CSA B125.2.

3. Drain: Conical basket strainer with removable stopper and NPS 1-1/2 inch chrome plated brass 90° elbow.

4. Material: Stainless steel body with polished finish.

2.7 TRAPS

A. Sink Traps:

1. Basis-of-Design Product: Subject to compliance with requirements, provide McGuire Manufacturing, Inc. No. 8912-F or comparable product by one of the following:

a. American Standard America.
b. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow, 17-gauge brass tube to wall with cleanout plug. Include chrome-plated brass escutcheon with set screw.

3. Standard: ASME A112.18.2/CSA B125.2.

4. Size: NPS 1-1/2 by 1-1/2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install water-supply piping with stop on each supply to each sink faucet. Install stops in locations that are accessible for ease of operation.

D. Install trap and waste piping on each drain outlet of each sink to be connected to sanitary drainage system.

E. Set floor-mounted sinks in leveling bed of cement grout.

F. Install wall flanges or escutcheons at piping wall penetrations and casework penetrations. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants” and sink manufacturer’s recommendations.

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 FIELD QUALITY CONTROL

A. Comply with “Field Quality Control” article in Part 3 of Section 22 05 00 “Common Work Results for Plumbing” for lead testing requirements prior to commencing any work.

B. Inspecting Agency: Engage a qualified laboratory to perform lead testing on all potable water faucets installed under this contract and used or potentially used for drinking or cooking purposes according to NYS Law 10 CRR-NY 67-4.1. Submit test results to the Owner and the Architect.

C. Replace any faucet that exceeds the lead action level (5 micrograms per liter) and coordinate with the Owner for retesting until satisfactory results are obtained.

3.5 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
B. Adjust water pressure at faucets to produce proper flow.

3.6 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.
B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
C. Provide protective covering for installed sinks and fittings.
D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 16.16

SECTION 22 47 16 - PRESSURE WATER COOLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pressure water coolers.
2. Bottle filling stations.
3. Supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler and bottle filling station include construction details, material descriptions, dimensions of individual components and profiles, finishes, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. Surface Wall-Mounted, Stainless Steel.
2. Supply fittings.
3. Traps.

B. Shop Drawings:

1. Include diagrams for power wiring.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers and bottle filling stations to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Water Conservation:

1. Provide plumbing fixtures complying with applicable provisions of Section 604.4 of the Plumbing Code of New York State.

1.6 FIELD CONDITIONS

A. Refer to the "Project/Site Conditions" article in Section 22 05 00 "Common Work Results for Plumbing" for lead testing requirements prior to commencing any work.
B. Coordinate potable water lead testing with Owner prior to starting any construction.

1.7 MAINTENANCE MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filter Cartridges: Equal to 5 percent of quantity installed for each type and size indicated, but no fewer than 2 of each.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

1. Pressure water coolers and bottle filling stations intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 or NSF 372, or be certified in compliance with NSF 61 or NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2. Comply with ASHRAE 34 for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.

3. Comply with UL 399.

4. Comply with ASME A112.19.3/CSA B45.4.

5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

6. Comply with NSF 42 and NSF 53 for water filters for water coolers and bottle filling stations.

7. Comply with ICC A117.1 for accessible water coolers and bottle filling stations.

2.2 PRESSURE WATER COOLERS

A. Pressure Water Coolers - Surface Wall-Mounted, Stainless Steel: (EWC “A”).

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay; Model No.LZS8WSSK with Model 51299C Lead + Microplastics Filter or a comparable product by one of the following:

    a. Halsey Taylor.
    b. Murdock Manufacturing; A Division of Morris Group International.
    c. Oasis International.

2. Source Limitations: Obtain surface wall-mounted, stainless steel, pressure water coolers from single source from single manufacturer.

3. Cabinet: Single, all stainless steel.

4. Bubbler: Abrasion-resistant, anti-sweat, pliable polyester elastomer with infused anti-microbial, keyed in location to prevent rotation, with adjustable stream regulator, located on cabinet deck.

5. Control: Push bar on front and sides.

6. Bottle Filling Station: Stainless steel construction with ABS plastic alcove and the following features:

    a. Electronic sensor for touchless activation with auto 20-second shut off.
    b. Filling Rate: 1.1 gpm.
    c. Laminar flow to minimize splashing.
    d. Integral drain to eliminate standing water.
    e. LED visual filter monitor to indicate when filter requires replacement.

7. Drain: Grid with NPS 1-1/4 tailpiece.

8. Supplies: Comply with requirements in “Supply Fittings” Article.

9. Trap: Comply with requirements in “Trap” Article.

10. Filter: NSF/ANSI Certified filter designed to reduce lead, particles and chlorine.

    a. Tested and certified to NSF 42 and 53 for lead, Class 1 particulate, chlorine taste and odor reduction.
    b. Tested and certified to NSF/ANSI 401 for the reduction of microplastics.

11. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

B. Supports

1. Support: Manufacturer's support frame attached to substrate.

2. Capacities and Characteristics:

a. Cooled Water: 8 gph.

b. Ambient-Air Temperature: 90 deg F.

c. Inlet-Water Temperature: 80 deg F.

d. Cooled-Water Temperature: 50 deg F.

e. Electrical Characteristics:

1) Motor Horsepower: 1/5.
2) Volts: 120 V ac.
3) Phase: Single.
4) Hertz: 60 Hz.
5) Full-Load Amperes: 6 A.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Basis-of-Design Product: Subject to compliance with requirements, provide McGuire Manufacturing, Inc. No. LFBV07-F or comparable product by one of the following:

1. American Standard America
2. Zurn Industries, LLC; Commercial Brass and Fixtures.

C. Standard: ASME A112.18.1/CSA B125.1.

D. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass escutcheon with set screw.

E. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

F. Operation: Wheel handle.

G. Risers:

1. NPS 3/8.
2. ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.4 TRAPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide McGuire Manufacturing, Inc. No. 8872C-F or comparable product by one of the following:

1. American Standard America.
2. Zurn Industries, LLC; Commercial Brass and Fixtures.

B. Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow, 17- gauge brass tube to wall with cleanout plug. Include chrome-plated brass escutcheon with set screw.

C. Standard: ASME A112.18.2/CSA B125.2.

D. Size: NPS 1-1/4 by 1-1/4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
B. Examine walls and floors for suitable conditions where fixtures will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install mounting frames, affixed to building construction, and attach recessed, pressure water coolers, and bottle filling stations to mounting frames.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping.

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

G. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
C. Install ball shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 22 05 23 "General Duty Valves for Plumbing Piping"
D. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ELECTRICAL CONNECTIONS

A. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
B. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Engage a qualified laboratory to perform lead testing on all potable water fixtures installed under this contract and used or potentially used for drinking or cooking purposes according to NYS Law 10 CRR-NY 67-4.1.

B. Replace any drinking fountain that exceeds the lead action level (5 micrograms per liter) and coordinate with the Owner for retesting until satisfactory results are obtained.

3.6 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.
B. Adjust pressure water-cooler temperature settings.

3.7 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
C. Provide protective covering for installed fixtures.
D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 47 16

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and all Division 01 Sections, apply to this Section and to all of Division 23.

1.2 SUMMARY

A. This Section includes the following:

1. Definitions, references, and abbreviations.
2. General regulatory requirements.
3. General requirements regarding site/field conditions including existing conditions and field measurements.
4. Sequencing and scheduling including coordination.
5. Definition of design equipment and procedures for consideration of specified equivalents, proposed equivalents, or substitutions.
6. HVAC demolition.
7. Equipment installation requirements common to equipment sections.
8. Minimum material requirements and equipment verification.
9. Electrical components for HVAC Work
10. Mechanical penetrations, waterproofing, and sealants.
11. Fire-stopping
12. Access doors
13. General requirements for demonstration of completed systems

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. "Design Equipment", "Design Make", "Basis of Design", and similar terms: Equipment, specified in Technical Specification Section or on Contract Drawings using applicable manufacturer's designation, that forms the basis for performance requirements, physical dimensions, configuration, electrical connection requirements, and similar aspects used in the design of this Project including (but not limited to) physical configuration of surrounding construction and location of connections to other components.

G. Specified Equivalents: Products identified in Technical Specification Section that may provide performance complying with specified requirements but may not have the same arrangement, configuration, size, construction, or other aspects as the specified Design Equipment. Refer to Section 00 21 13 "Instructions to Bidders", and Section 01 25 00 "Substitution Procedures" for additional information and requirements regarding equivalents and substitutions.

H. "Equivalents", "Proposed Equivalents", "Proposed Products" and similar terms: These terms may be used interchangeably and mean the same thing: Products NOT identified in Technical Specification Section that the Contractor proposes in accordance with Section 00 21 13 "Instructions to Bidders" and Section 01 25 00 "Substitution Procedures".

I. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor, all in accordance with Section 01 25 00 "Substitution Procedures".

J. Heating Work: Refers to Heating, Ventilating and Air Conditioning Systems and Equipment where used in technical specification sections of Division 23.

1.4 ABBREVIATIONS

A. Abbreviations: Reference to technical society, organization, body or section made in Division 23 in accordance with the following abbreviations:

1.	AIA	American Institute of Architects
2.	ADA	Americans with Disabilities Act.
3.	AMCA	Air Movement and Control Association International, Inc.
4.	ANSI	American National Standards Institute
5.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
6.	ASME	American Society of Mechanical Engineers International
7.	ASTM	American Society for Testing and Materials International
8.	AWS	American Welding Society
9.	IEEE	Institute of Electrical and Electronics Engineers, Inc.
10.	NEC	National Electric Code
11.	NEMA	National Electrical Manufacturers Association
12.	NFPA	National Fire Protection Association
13.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
14.	UL	Underwriters Laboratories Inc.

1.5 SYSTEM DESCRIPTION

A. Provide complete systems, properly connected, tested, balanced, adjusted, and ready for operation, including all necessary and required controls, safeties, details and accessories, including (but not limited to):

1. Demolition and removals required for equipment and system installation, including all system fluid and solid components.
2. Piping systems and related equipment.
3. Refrigeration systems and related equipment.
4. Ventilation systems and related equipment.
5. Support Systems and related equipment.
6. Insulation Systems and related equipment.
7. Miscellaneous items required for equipment and system installation.
8. Controls and electrical control wiring to equipment furnished in this contract.
9. Electrical power wiring to equipment furnished in this contract, where not covered elsewhere.

B. Heating work drawings are Diagrammatic. Do not infer that Drawings show level of detail indicating every offset, elbow, union, fitting, elevation or aspect ratio changes, or other details required for complete installation.

1. Provide all required fittings, offsets, elevation changes, dampers, controls, components, and similar items not indicated on Drawings, as required for a complete properly operational system.

1.6 SUBMITTALS

A. General Division 23 submittal requirements:

1. Procedural Requirements: Comply with requirements of Section 01 33 00 “Submittal Procedures” and as modified below.

a. Specified Products: If product to be incorporated into Project is the basis of design equipment, and will be installed as specified in Part 3 in the product’s technical specification section, and only where allowed as such in submittal portion of product specification, then the “As-Specified Verification Form” (attached to Section 01 33 00 “Submittals Procedures”) may be used in lieu of “Product Data” identified.

b. Do not use “As Specified Verification Form” unless specifically indicated in detailed product specification.

c. Equivalent Products or Substitutions: If product proposed to be incorporated into Project is <u>not</u> the basis of design equipment, comply with all Product Data requirements specified.

2. Product Data: Submit Product Data for items listed in individual technical section. Clearly identify manufacturer, pertinent design, function, materials, construction, and performance data specifically addressing specification description and Contract Document requirements of item. Where more than one product is indicated on manufacturer product literature, strike out products that are not applicable to item being submitted, highlight options selected and proposed, and remove extraneous pages of catalogs not being used in the project..

    a. Cover Sheet: Attach cover sheet, identified in Section 01 33 00, to Product Data of each item submitted. Provide cover sheet for only one type of item with related accessories, equipment with related components. Do not combine unrelated items under same cover sheet.

    b. Specified Equivalent Product Data: Submit manufacturer's product information including product literature, technical specifications and descriptions, performance data, and similar items to demonstrate compatibility with Basis-of-Design Equipment as specified in "Manufacturers" in Part 2 - Products below.

3. Coordination Drawings: Prepare Coordination Drawings in timely manner to comply with overall construction schedule. Refer to Sections 01 31 00 and 01 33 00 for more details.

    a. Prepare drawings coordinating HVAC systems, lighting fixtures, ceiling mounted devices, ceiling heights, materials, structural work, maintenance clearances, electric code clearance, building systems, existing construction, etc. Provide additional details and sections, as required for clarity, at all places of potential conflict.

    b. Deliver Coordination Drawings in accordance with requirements specified in Section 01 31 00. Indicate areas of conflicts between HVAC systems and other building components by highlighting locations on drawings and separately listing.

    c. Reposition proposed locations of HVAC systems as required to work within project constraints. Adjust exact size, aspect ratio, location and offsets of ducts and pipes as required. Achieve as specified and other reasonable appearance objectives in open areas without ceilings without increase in Contract Sum.

    d. Review of Coordination Drawings in accordance with Section 01 31 00 does not relieve Contractor from responsibility for coordinating HVAC systems with Project work, nor does it authorize extra cost, omission or deviation from Contract Document requirements. Costs arising from errors or omissions in Coordination Drawings shall be borne by Contractor.

    e. Review Coordination Drawings and compare them with all other drawings to verify that all Work can be installed without interference. Notify Owner's Project Representative in case of unresolved interferences prior to installation of any work. Revise Coordination Drawings as required to eliminate installation interferences upon direction of Architect.

f. Do not proceed with installation of systems in each area until agreement is reached with all concerned on exact arrangements for each room or area, unless otherwise directed by Architect. If Contractor proceeds prior to resolving conflicts, Contractor shall modify installed Work as required to permit other systems to proceed with a coordinated installation.

4. Specified Equivalent Drawings: Submit detailed drawings of proposed Specified Equivalents, indicating proposed installation of equipment and showing maintenance clearances, required service removal space, and other pertinent revisions to arrangement and configuration shown in Contract Documents.

5. Closeout Information, for inclusion in Operations and Maintenance Manual:

a. Approved submittals.

1) If "As-Specified Verification Form" submittal is approved, also include product data as specified in technical section for all components used.

b. Include all information required in Section 01 78 23 "Operation and Maintenance Data".

c. Include all other closeout information required by the individual technical specification sections.

B. Shop Drawings: Include dimensioned plans, sections, and attachments to other work for concrete bases.

C. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

1. Sealants
2. Fire-stopping.
3. Access doors.

D. Samples:

1. Submit color chart with paint manufacturer's color samples for final color selections prior to beginning painting. Comply with additional requirements for color selection samples specified in Division 09.

E. Closeout Information, for inclusion in Operations and Maintenance Manual:

1. Approved submittals.

a. If "As-Specified Verification Form" submittal is approved, also include product data for all components used.

2. Include all information required in Section 01 78 23 "Operation and Maintenance Data".

3. Letters on manufacturer's letterhead from equipment manufacturers certifying that their equipment and systems have been installed in strict accordance with manufacturer's recommendations, properly aligned and adjusted, tested, lubricated, wired, balanced, etc.

4. Valve, Lubrication, Filter, charts as described below.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements

1. Comply with applicable requirements of all Federal, New York State, and Local Building, Health, Mechanical, Plumbing and Electrical Codes, Laws, Ordinances and Regulations, including (but not limited to):

   a. Building Code of New York State
   b. Mechanical Code of New York State
   c. Fire Code of New York State
   d. Energy Conservation Construction Code of New York State
   e. New York State Education Department Manual of Planning Standards
   f. In event of a conflict between the Codes identified above and Contract Documents, comply with more stringent requirement.

2. Comply with applicable requirements of NFPA, utility company regulations, and following standards:

   a. Provide Underwriters Laboratories (UL) labels on all electrical materials carrying 50 volts or more.
   b. Provide refrigeration equipment complying with Safety Code for Mechanical Refrigeration (ASHRAE Standard 15 - and ANSI Refrigeration Safety Code B9.1).

B. Certifications: Obtain and pay for all necessary inspections and certificates from all applicable agencies. Perform all required tests in accordance with regulation of agency having jurisdiction. Submit certificates of approval prior to Final Completion as defined in Section 01 77 00 “Closeout Procedures”. Submit certificates of approval prior to request for final acceptance of Contract.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner. Equipment must continue to comply with the requirements of the Energy Conservation Code applicable to the project.

D. Welding Quality Control for General Construction and Support Work:

1. This paragraph refers to qualifications for General Construction and Support Work welding only. Qualify welders, brazers, and any welding or brazing procedure to be used on piping for this Project in accordance with ASME "Boiler and Pressure Vessel Code", Section IX, as specified and detailed in Section 23 21 13 “Hydronic Piping”.

2. Welding and Brazing Procedure Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel." Qualification may by made by technically competent group or agency (subject to approval) meeting the following conditions:

    a. Group or agency qualifying the procedure meets all procedure qualification requirements of AWS D1.1/D1.1M, "Structural Welding Code - Steel.".

    b. Contractor accepts full responsibility for procedure qualified.

    c. Contractor has qualified at least one welder or welding operator using procedure qualified and provides record of qualification.

    d. Contractor accepts full responsibility for qualified procedures by signing related qualification records with procedure and performance qualifications including all dates, results, and associated data.

3. Welders' and Brazers' Qualifications: Ensure that all welders, welding operators, brazers, or brazing operators employed for this project are qualified for all welding and brazing procedures, proposed as part of this Project, in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel.". Qualification by previous employer or technically competent group or agency (subject to approval) may be acceptable if following information is included:

    a. Documentation that the previous qualification was for essentially the same procedures proposed and was in full accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel.".

    b. Copy of performance qualification testing record showing who qualified the worker, date of qualification, and work history record showing continuous performance to maintain qualification.

4. Weld and Braze Qualification Records: Maintain and sign certified records of approved procedures used and approved qualified workers employed for welded and brazed joints performed as a part of Prime Contract. Ensure all welding and brazing work can be traced to a specific procedure and welder.

5. Inspection and Examination by Owner, Remedy by Contractor: Owner reserves right to examine, inspect, and test all piping using visual, radiographic, or other recognized testing methods to determine compliance with specified quality control requirements and requirements of applicable regulatory agencies.

    a. Cost of Owner's testing of acceptable installation provided at Owner's expense.
    b. Repair piping installations not passing Owner's quality inspection testing using approved method or replace at no additional cost.
    c. Cost of initial testing of piping not conforming to specified requirements and any retesting of repairs or replacement work shall be deducted from Contract Sum.

E. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Ship materials in manufacturer's containers, fully identified with manufacture's name, trade name, type, class, style, model, grade, size and color.

B. Storage and Protection

1. Store materials, equipment, fixtures, pipe, fittings, attachments, under cover, off ground in original containers as applicable, and protect from physical and weather damage while in storage and during construction.

2. Furnish extra materials identified in technical sections, in original manufacturer's containers and packaging, to Owner at location identified during Preconstruction Conference. Obtain receipt from Owner upon delivery of extra materials and send copy of receipt to Architect.

3. Replace or repair damaged, rusted, corroded or otherwise unusable materials physically damaged or weather damaged equipment as determined by Architect, at no change in Contract Sum.

1.9 PROJECT/SITE CONDITIONS

A. Field Measurements

1. DO NOT SCALE DRAWINGS: Refer to Architectural and Structural drawings for dimensions and details, and verify measurements in field before proceeding.

2. Install all items with proper provision for removal and access to coils, valves, traps, and similar components.

3. Layout of equipment, piping, and similar components in Drawings is diagrammatic. Review Drawings in the field, identify interference with other construction and verify dimensions at Site prior to beginning installation.

a. Obtain exact size and location of all items and openings and confirm all existing conditions in field. Review Shop Drawings of all Contracts.

b. Coordinate all Heating Work that interferes with other construction with other responsible Contractor.

c. Obtain exact location and roughing requirements for all equipment furnished by others, but installed by this Contractor before roughing. Owner reserves right to make reasonable changes prior to "roughing-in" without increase in Contract Sum.

4. Report any conflicts to Architect in writing before beginning installation.

1.10 SEQUENCING AND SCHEDULING

A. Perform all Heating Work in cooperation with Owner, Architect, Construction Manager, and all Contractors on this Project, and other separate Contractors at the Site.

1. Coordinate all Heating Work with construction schedule requirements in Division 01
2. Coordinate all submittals with the construction schedule and with requirements and schedules contained in Section 01 33 00 “Submittals Procedures”.
3. Immediately report any delays in receipt of materials required for Heating Work including circumstances causing delays.

B. Existing Construction: Provide openings, chases, recesses, lintels and bucks required for admission of Heating Work, unless otherwise noted. Do not cut waterproofed floors or walls for admission of equipment or materials without written permission. Do not pierce structural members without written permission.

C. New Construction:

1. Obtain and furnish necessary information, such as locations and sizes of heating construction, fixtures and equipment, to all Contractors in ample time for installation of openings, chases, recesses, lintels and bucks required for admission of project construction, fixtures and equipment.

2. Provide sleeves, inserts, panels, raceways, boxes, and similar components, ahead of schedule required for Heating Work installation and ahead of associated General Work. Provide Heating Work representative during installation of General Work responsible for maintaining items in position.

D. Supports for Heating Work: Provide anchor bolts required supporting or securing Heating Work. Locate settings and check locations as construction progresses. Provide templates or holding fixtures as required to maintain proper accuracy.

E. Cutting and Patching: Bear expense of cutting, patching, repairing or replacing of work of all Contracts required due to fault, error or damage by contractor responsible for Heating Work, unless otherwise specified in Contract Documents. Employ and pay Prime Contractor involved, or if there is no associated Prime Contractor, employ and pay qualified subcontractor as required for corrective work.

F. Refer to Division 01 for cooperation between Contractors. Prior to start of construction:

1. Obtain from Contract Drawings or Architect, exact location of items and openings in construction. Conform to existing conditions in field.

2. Review Shop Drawings of all Contracts.

3. If conflict occurs between Contract Drawings, advise Architect in writing before beginning installation and comply with Architect's directions.

4. Obtain exact location and roughing requirements for equipment furnished by other Contractor or by Owner, but installed by Contractor responsible for Heating Work before beginning roughing.

1.11 COORDINATION

A. Pre-Installation Conference:

1. Attend pre-installation conference. Arrange for all subcontractors to be in attendance.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

E. Coordinate Heating Work with plumbing systems, lighting fixtures, ceiling mounted devices, ceiling heights, materials, structural work, maintenance clearances, electric code clearance, and building systems. Verify that Work of all Contractors can be installed without interference with Heating Work.

F. Notify Architect in case of unresolved interferences prior to installation of Heating Work.

G. Adjust exact size, location and offsets of exposed HVAC components to achieve reasonable appearance objectives without increase in Contract Sum.

H. Testing and Balancing: Cooperate with contractor responsible for Testing and Balancing work as required ensuring complete and proper testing, balancing and adjustment of air and water systems. Refer to Section 23 05 93 “Testing, Adjusting, and Balancing for HVAC”, for details.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Equipment – Provide as specified and scheduled with all options as required for full compliance.

B. Specified Equivalents - If Specified Equivalents (refer to "Definitions" in Part 1 above) are proposed, comply with following requirements:

1. Submit "Specified Equivalent Drawings" as specified in "Submittals" in Part 1 above.

a. Provide required changes in design and adjacent construction or equipment at no increase in Contract Sum.

1) Where required, provide larger motors, equipment, additional control devices, valves, fittings, and other miscellaneous equipment necessary for proper operation and provide proper location of roughing and connections to other Contractors.

2) Provide additional motors, starters, power, wiring, and control wiring required.

3) Provide revisions to equipment, wiring, support structure, controls, valves, fittings, and other miscellaneous equipment.

4) Additional Architectural and Engineering work, coordination, and documentation.

b. If proposed arrangement for Specified Equivalent is rejected, revise to be compliant and resubmit or submit Basis-of-Design Equipment.

2. Submit "Specified Equivalent Product Data" as specified in "Submittals" in Part 1 above to demonstrate that proposed Specified Equivalent is equal to or better than Basis-of-Design Equipment with respect to all performance characteristics, including but not limited to durability, individual equipment operating costs, entire interrelated system operating costs, service access, noise levels, vibration levels, compatibility with Owner's other existing equipment to minimize parts inventory, aesthetics where applicable, and similar characteristics.

3. Do not assume that approval of a specified equivalent submittal implies approval of the installed product. Correct all deviations uncovered during construction and warrantee period that result in or are caused by any lower performance characteristic than the specified Basis of Design equipment.

C. Proposed Equivalents and Substitutions: In addition to requirements described elsewhere in these Contract Documents, all proposed equivalent and substitution products being considered shall be subject to the Specified Equivalent requirements listed above.

2.2 MATERIALS

A. Minimum Material Requirements:

1. Provide electrical equipment and systems meeting UL standards and requirements of NEC.

2. Provide UL label on all equipment and material with listing service.

3. Material Flammability:

   a. Flame spread rating of 25 or less.
   b. Smoke developed rating of 50 or less.

4. Equipment Verification: Carefully check manufacturer's drawings and specifications as they affect their particular equipment; follow factory instructions for roughing, installation, connection, filling, lubrication, testing, balancing, adjusting, alignment, wiring, and start-up operation.

2.3 MOTOR POWER TRAIN ACCESSORIES

A. For all new motor installations, whether in new equipment or installed as replacement motors, provide accessories listed below as required for a complete new drive system.

2.4 PENETRATION FIRESTOPPING

A. Comply with requirements for sealants in fire rated penetrations specified in Section 07 84 13 “Penetration Firestopping”.

B. Submit Manufacturers Product Data Sheets for each type of product selected. Certify that Firestop Material is free of asbestos and lead paint, and complies with local regulations.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Submit system design listings, including illustrations from qualified testing and inspection agency that is applicable to each firestop configuration.

D. Submit a project specific Penetration Firestopping Schedule indicating where each firestop configuration will be used.

2.5 ACCESS DOORS

A. Comply with requirements for access doors specified in Section 08 31 13 “Access Doors” and Frames for product requirements of access doors in general construction.
B. Comply with requirements for access doors specified in Sections 23 31 00 “Ductwork” and 23 33 00 “Ductwork Accessories” for product requirements of access doors in Air Ducts.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

A. Examine existing conditions in the field prior to beginning demolition or contract Work as required to confirm conditions are appropriate for the work to proceed. Refer to Section 01 73 00 "Execution" and Section 02 41 19 "Selective Demolition" for additional information and general demolition requirements and procedures.

B. Reuse materials and equipment only as indicated on Drawings. Furnish new equipment and materials in conformance with Contract Documents for all Heating Work, including any material, operation, method or device mentioned, listed or noted within Division 23 Sections, unless reuse is specifically indicated, or unless specified as furnished or installed by Owner, all Contractors, or others.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is otherwise made unserviceable by adjacent or associated work or error, remove damaged or unserviceable portions and replace with new products of equal capacity and quality. Verify, document, and confirm pre-existing damage with Owner and Architect before beginning work.

3.2 HVAC DEMOLITION

A. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

1. Prior to removal of system components, provide for proper working conditions including but not limited to:

a. Electrically shutdown and/or disconnect with lockout / tag as required.
b. Provide Personnel Protection Equipment.
c. Air Systems: seal off portions of systems not under construction as required protecting Owner’s belongings.
d. Hydronic Systems: Properly isolate and drain systems as required protecting Owner’s belongings.
e. Refrigerant Based Systems: Evacuate and retain refrigerant per ASHRAE 15 and 40 CFR 82.

2. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material at point of continued use or as otherwise specifically indicated.

3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.

4. Equipment to Be Removed: Disconnect and remove equipment and all associated accessories. Plug, cap, seal, and otherwise patch to match as required.

B. Disposition of Removed Components:

1. All material and equipment shown on the drawings to be removed during project Work that is not indicated on the drawings as being either reused or turned over to the Owner becomes the Contractor's property as a part of the project including salvage value and legal disposal cost complete.

2. For components that become the Contractor's property through this removal process: Confirm transfer of ownership in writing then promptly remove from the site and legally process.

3. For components indicated on the drawings to be turned over to the Owner: deliver to a project site location designated by the Owner.

4. For components indicated on the drawings to be reused: carefully remove, protect, and store until appropriate time for re-installation. Document any pre-existing damage prior to removals.

5. For pipe and tubing indicated to be reused, reuse only those portions of pipe, tubing, and associated fitting assemblies where they are direct replacements of the as specified and as shown new piping assemblies. Valves, strainers, other piping specialties, and insulation shall not be re-used unless specifically indicated on drawings.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are 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.

E. Ensure each equipment manufacturer:

1. Carefully checks Contract Drawings and Specifications applicable to manufacturer's equipment before roughing.

2. Reports to Architect, before or when Shop Drawings are submitted, any discrepancies or conditions applied to manufacturer's equipment that prevents proper functioning, servicing, and other aspects of equipment operation.

3. Provides manufacturer's printed installation instructions for each piece of equipment.

4. Thoroughly instructs Contractor exactly how equipment should be installed, connected, lubricated, started, operated, and similar aspects to ensure all factory instructions are rigidly followed during installation of equipment.

F. Install, test, start, and operate equipment as instructed by manufacturer.

G. Submit written evidence from equipment manufacturer that manufacturer's equipment and systems have been:

1. Installed in strict accordance with manufacturer's recommendations.
2. Properly aligned and adjusted, tested, lubricated, wired, balanced, and similar operations

H. Equipment Connections

1. Provide final condensate, heating water, drain, vent, refrigerant, connections to all equipment as required.

2. Provide isolation valves and flanges or unions on the supply and return piping connections to all equipment arranged as required for reasonable service isolation and access.

3. Provide equipment waste, drip, overflow, condensate, and drain connections extended to floor or roof drains or other approved points of discharge. Provide integral condensate pumps and appropriate piping for units where gravity condensate drain is not practical or possible.

4. Connect equipment complete and ready-to-use, including all valves, piping, piping accessories, traps, gauges, vents, drains, insulation, sheet metal work, controls, dampers, and similar components required.

I. Precautions Against Freezing: In addition to applicable requirements in Division 01 and individual technical sections, take all necessary precautions with equipment and systems to prevent damage to building, piping, equipment, and other components due to freezing and water leakage until final acceptance. Before freezing weather occurs, make certain all:

1. Safety features are properly functioning.
2. Freeze protection is tested and sensing elements are properly located.
3. Openings around outside grilles, louvers, and similar items are properly sealed; notify Architect in writing if openings are not adequately sealed.
4. Outside air dampers are tight fitting and operational, and damper motors are properly winterized.
5. Air systems are properly balanced.
6. Proper insulation is installed where required.

J. Concealment: Conceal all Work not specifically shown on the Drawings as exposed. Note piping risers may be shown outside of walls due to scale of drawing symbols – the general intent is for these pipes to be concealed within the general construction if possible or if not possible, to be within riser chases. If for any reason concealment is impossible, notify the Architect and obtain written approval before starting that part of the Work.

K. Exposed Items: Install exposed items as shown on Drawings or as approved by Architect. Obtain Architect's approval for final arrangement and appearance before installing items in areas without ceilings.

L. Damaged Components and Replacement: If pipe, duct, insulation, or any HVAC component or equipment is damaged in appearance or is otherwise unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.4 ERECTION OF SUPPORTS AND ANCHORAGES

A. Provide a complete system of support and anchorage for all Contract work.

B. Refer to Section 23 05 29 “Hangers and Supports for HVAC Components”, Section 23 05 48 “Mechanical Wind Load Control”, and Division 05 and Division 06 complete for detailed additional requirements.

3.5 MECHANICAL PENETRATIONS, WATERPROOFING, AND SEALING

A. Openings Through Roofs: Curbs are required for rooftop air handling equipment, ventilators, fans, piping penetrations, etc. Roofing, flashing, and general waterproofing are the responsibility of the Contractor unless specifically indicated otherwise elsewhere in the Contract Documents. Refer to Architectural Drawings for related work by others.

1. Use factory pre-fabricated units as specified and noted on Drawings.

2. Caulk and waterproof neatly with additional material as required.

3. Employ the services of an approved roofing sub-contractor for all patching and/or new work indicated as part of the Heating Work.

4. Any roofing work performed under this Contract shall be performed in such a way as to not void any existing roofing warrantee. Additionally, whether there is a roofing warrantee currently in force or not for roof in area of new penetrations, all new penetration work shall be warranted leak free for a period not less than one year from final acceptance of project.

5. Provide structural support for roof deck around all roof curbs and roof deck penetrations larger than 12 inch x 12 inch, unless specifically indicated otherwise elsewhere on the Contract Documents.

B. Opening Through Outside Walls:

1. Guarantee all penetrations to be thoroughly air and watertight. Caulk and flash duct penetrations in accordance with specifications, details on Drawings, and as required.

2. Install louvers in accordance with specifications, manufacturer’s recommendations, and details, as required to achieve guaranteed air and watertight penetrations. Direct drainage to drip away from building surface.

3. Use special waterproof construction as directed.

4. Provide mechanical sleeve seals for piping penetrations.

5. Provide structural support for wall above all penetrations wider than 12 inches, unless otherwise indicated elsewhere on the Contract Documents.

C. Openings Through Floors and Inside Walls: Provide through penetration systems for all mechanical work floor and wall penetrations which do not compromise the integrity of the floor or wall with regards to fire rating, smoke passage rating, or acoustical noise reduction rating. Ensure through penetration system does not transmit mechanical vibrations to building walls or floors. Seal all floor penetrations to effectively block the passage of smoke and fumes.

1. Provide structural support for floor deck around all penetrations larger than 12 inches in any dimension, unless specifically indicated otherwise elsewhere on the contract documents.

3.6 FIRESTOPPING

A. Provide Through-Penetration Firestopping Systems and Devices listed in UL Fire Resistance Directory under categories XHCR and XHEZ and conforming to construction type, penetrant type, annular space requirements and fire rating indicated or required for each application.

B. Provide systems that withstand passage of cold smoke either as inherent property of system or by use of separate product included as part of UL system or device designed to perform this function.

3.7 PROTECTION

A. Maintain systems during construction, temporary use, and until acceptance by Owner.

1. Properly lubricate all HVAC systems bearings during use.
2. Maintain limit controls, overload devices, and safety controls in operating condition during use

3.8 ALTERATIONS

A. Provide protection of existing facilities, demolition and removals, replacement and restoration, including patch-to-match requirements, and hazardous materials procedures to install Heating Work in conformance with Division 01 requirements.

B. Provide cutting and patching required to install Heating Work in accordance with the requirements of Division 01 covering cutting and patching.

3.9 ADJUSTING AND CLEANING

A. Adjust all work as required to insure systems perform as designed and as intended, including but not limited to the following:

1. Adjust all registers and diffusers to insure even air distribution free of objectionable drafts. Include all new and all existing to remain registers and diffusers on systems where HVAC modifications are made.

2. Adjust all hangers and supports to insure proper piping slope, alignment of flexible connections, even loadings, proper venting and draining, proper control over thermal expansion, etc.

3. Adjust all mechanical equipment insuring it runs properly as intended, providing the performance specified and required, and as required to maintain all warrantees.

B. Clean work furnished or provided as part of Heating Work, including but not limited to equipment, control panels and devices.

1. Refer to and comply with Section 01 50 00 “Temporary Facilities and Controls” for additional requirements for cleaning during construction and Section 01 77 00 “Closeout Procedures” for additional requirements for final cleaning.

2. Remove debris, leftover piping, tubing, metal, insulation, cartons, papers, etc., resulting from Heating Work.

3. Remove all rust, dirt, oil, etc. from Heating Work to be painted and maintain in condition ready for painting.

4. Clean inside and outside of all equipment and distribution systems provided including (but not limited to) following:

a. All enclosures.

b. Remove all rust, oils, and similar contamination from all equipment, piping and supports to be painted, and leave components ready for painting.

c. Remove debris, leftover piping, wiring, tubing, metal, insulation, cartons, papers, and similar items left in building or on Site. Clean building as often as necessary and when directed by Architect.

C. Final Cleaning: In addition to requirements specified in Section 01 77 00 “Closeout Procedures” and other sections in Division 23, provide following measures.

1. Where heating units have been used to provide temporary heat, clean all permanent filters, replace all disposable filters, and clean all ducts, blowers, and coils.
2. Provide written notification to Architect upon completion of all final cleaning procedures and request inspection of final cleaning.

3.10 DEMONSTRATION OF COMPLETED SYSTEMS:

A. Prior to Final Completion, thoroughly demonstrate and instruct Owner's designated representatives in care and operation of all heating and ventilating systems and equipment provided in Heating Work. Provide necessary skilled labor to operate all systems for not less than 5 days and provide required instruction.

1. In addition to Contractor's instruction, arrange for technically qualified factory representatives to train Owner's designated representatives in care, maintenance, and operation of following manufacturer's equipment and systems.

a. Temperature controls.
b. Central station air handling equipment and units.
c. Energy recovery equipment.
d. Air conditioning units and equipment.

2. Coordinate and schedule time and place of all training through Architect at Owner's convenience.

3. Submit letters verifying satisfactory completion of all instruction including date of instruction, names of persons in attendance and countersigned by authorized representative of Owner.

4. Until final acceptance, Contractor retains full responsibility for systems operations and maintenance, even though operated by Owner's personnel during instruction, unless otherwise agreed to in writing.

5. During instruction, provide list, sealed in clear plastic, outlining operating, maintenance, and starting precautions and procedures to be followed by Owner for operating systems and equipment.

B. Valve Identification Chart: Provide a valve chart for all valves installed in contract.

1. Provide 8-1/2 inch x 11 inch minimum size Valve Identification Chart, typed in capital letters, mounted under clear laminated plastic; secure to wall where directed.

2. Valve Numbering System: Extension of and compatible with existing valve numbering system, where valves are installed in existing building or in addition to existing building. Do not duplicate existing numbers; verify existing numbers in the field.

3. List all valves included in Contract. Obtain necessary information containing the following:

a. Valve number, piping system, system abbreviation (as shown on valve tag) and location of valve.
b. Normal operating position (open, closed, or modulating).
c. Clearly identify special purpose valves (for emergency shutoff, etc.).

C. Air Filter Chart: Provide an air filter chart for all equipment installed in contract.

1. Chart shall be 8-1/2 inch x 11 inch minimum size, typed in capital letters, mounted under clear laminated plastic; secure to wall where directed.

2. List all equipment that includes filters in Contract. Obtain necessary information containing the following:

    a. Name and location of equipment
    b. Type of filters recommended by the manufacturer.
    c. Size of filters for each piece of equipment.
    d. Recommended replacement schedule from unit manufacturer.

END OF SECTION 23 05 00

SECTION 23 05 13 - COMMON ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. General requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

2. Starters and accessories for electric motors.

3. Electrical auxiliary components required for HVAC systems that are not specifically identified in “Electrical” series Drawings or Division 26.

4. Electrical wiring required for HVAC systems that is not specifically identified in “E” series Drawings or Division 26.

1.3 SUBMITTALS

A. General: Submit all action submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data: For each type of product indicated, demonstrating compliance with all specified performance and construction characteristics.

C. Closeout Submittals:

1. Installation, Operation, and Maintenance Data: For motors, drives, electrical power components, include in operation and maintenance manuals.

a. Wiring Diagrams: Employ competent technical aid to prepare composite wiring diagrams for field wiring of power, signal, and control wiring for all equipment and systems installed as part of the HVAC Work. Deliver diagrams to proper parties in time for roughing of conduit and equipment connections. Clearly indicate all items to be mounted or wired as part of DIVISION 26. Include as built wiring diagrams in O&M manual.

1.4 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Manufacturers: Provide products by one of following manufacturers or equal, except where unusual configurations involving frame, hermetic seals, shaft, bearing, or starting characteristics are peculiar to particular item of equipment as specified by Architect:

1. National Resource Management (NRM).
2. Baldor.
3. General Electric.
4. U. S. Motors.

B. Provide all motors required for the work of Division 23 specifications. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or individual technical specification sections.

C. Provide all motors suitable for operation at the frequency, voltage, and phasing of the building power.

D. Provide constant speed motors 1/3 HP and smaller designed for operation on single phase, 120 volts +/- 10 percent.

E. Comply with NEMA MG 1 unless otherwise indicated.

F. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS AND APPLICATIONS

A. Provide each motor suitable for continuous duty operation at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level, and suitable for speed, enclosure, rating, type and horsepower not less than as scheduled or specified in Contract Documents. Provide motor enclosure and maximum allowable temperature rise in degrees Centigrade over 40 deg. C ambient as follows, unless otherwise specified:

1. General Purpose: Drip-proof 40 deg. C or encapsulated design 60 deg. C.
2. Roof-top unit, damp, high humidity, or condensing applications: Totally enclosed fan-cooled 50 deg. C or drip-proof encapsulated design 60 deg. C.

3. Motors, wiring, and disconnects installed in potentially flammable atmosphere: UL listed, NEC rated explosion proof construction, fan-cooled 50 deg. C rise.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Each equipment manufacturer is responsible for ensuring motors supplied with manufacturer's equipment are fully compatible with the application and capable of starting and running driven equipment without undue noise, heating, or distress.

2.3 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.
5. Electronically Commutated Motor (ECM)

B. Motors 1/20 HP and Smaller: Shaded-pole type.

C. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

D. Variable Speed Motors: Electronically commutated motor (ECM) shall be of permanent magnet, brushless DC premium efficiency design with variable speed electronic controller capable of maintaining constant speed, torque, and/or cfm as required by service, capable of accepting 0-10vdc or 4-20mA speed control signal from building management system. Adjustable slow start and gradual speed changes, permanently lubricated ball bearings, and extra quiet operation are all included.

E. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

F. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 POLYPHASE MOTORS

A. Single Speed General Application Motors:

1. NEMA MG 1, Design B, medium induction motor.
2. Efficiency: Premium efficiency, as defined in NEMA MG 1.
3. Service Factor: 1.15.
4. Random-wound, squirrel cage rotor.

5. Re-greaseable, shielded, antifriction ball bearings suitable for radial and thrust loading.
6. Insulation: Class F.
7. Temperature Rise: One class below insulation rating.
8. Motors 15 HP and Larger: NEMA starting Code F or Code G.
9. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
10. Enclosure Material: Manufacturer's standard rolled steel or cast iron enclosures corresponding to NEMA rating and application requirements.

B. Multi-Speed General Application Motors:

1. Similar to single speed motor requirements above, with separate winding for each speed.

2. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

C. Motors Used with Variable Frequency Controllers:

1. Motors shall meet all other requirements of this document, the driven equipment manufacturer, and the Variable Frequency Controller manufacturer, and be rated for this service with the drive and voltage intended. Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

2. All three phase motors for use with variable frequency controllers shall be special application, inverter duty premium efficiency motors of cast iron construction.

3. Ratings shall be in accordance with NEMA MG-1, Part 31 requirements for the specific application.

4. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

5. Class B temperature rise; Class F insulation.

6. Thermal protection via one Class F thermostat per phase, NEMA MG 1 compliant with requirements for thermally protected motors.

2.5 MOTOR ACCESSORIES

A. For all new motor installations, whether in new equipment or installed as replacement motors, provide accessories listed below as required for a complete new drive system.

2.6 STARTERS

A. Manufacturers: Provide all starting equipment and control devices manufactured by same manufacturer and furnished through single responsible supplier unless otherwise specified in Contract Documents. Factory-wired or assembled packaged equipment may be provided with starting equipment of any acceptable manufacturer. 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. Cutler-Hammer
2. General Electric
3. Square D

B. Provide starters, contactors, and controllers complying with applicable NEMA standards, minimum size 0, and enclosed in enclosures of type appropriate for environment where installed including general purpose, explosion proof, weather resistant, or weather-tight construction as required.

C. Ensure all parts subject to wear, arcing, and similar use are easily removable.

1. Provide necessary auxiliary contacts for each starter subject to electrical interlock or automatic control.

2. Equip magnetic starters for motors operating 208 volts and over, line-to-line, equipped with self-contained light loads imposed thereon with a control transformer having a 120-volt grounded secondary winding, and having 120-volt starter operating coils.

D. Provide combination-type magnetic starters with fused disconnect switches. Fuse with class R fuses. Protect all starters with manual reset, solid state overload relay equal to (Square "D" motor logic) in one leg of single phase line to neutral circuits, in two legs of single phase line-to-line circuits, and in three legs of 3-phase circuits.

E. Provide 6-volt, red pilot light, integral transformer and long life bulb for all starters and contactors.

F. Manual Starters: Toggle operated, single pole for line to neutral circuits, two pole for line-to-line circuits, with thermal overload devices and neon pilot light; flush mounted unless shown otherwise, ganged with selector switch for multispeed applications. Provide manual starters similar to one of the following:

1. General Electric CR-101
2. Cutler-Hammer 9101
3. Square D Class 2510

G. Combination Magnetic Starters: Single speed, across the line, HAND-OFF-AUTO selector switch in cover. Provide combination magnetic starters similar to one of the following:

1. Cutler-Hammer 9589
2. General Electric CR-107
3. Square D Class 8538

H. Magnetic Contactors: With control coil in series with temperature controls as required.

2.7 COMPONENTS

A. Electrical Wiring: Provide all materials conforming to NEMA Standards and UL approved for intended service. Refer to appropriate sections in Division 26.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which materials and methods are to be installed and notify Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in acceptable manner.

1. Installation indicates conditions are acceptable to Contractor as required to ensure requirements for applicable warranty or guarantee can be satisfied.

2. Motors and Starters: Confirm electrical characteristics for all equipment.

3. Electrical Wiring: Check all electrical wiring associated with equipment for compliance with specifications and correctness of connections. Correct wiring in event equipment or devices fail to function in specified manner, whether due to incorrect connections or improper information and wiring diagrams.

B. Inspect and perform tests on project electrical wiring, including infrared scans (thermography), resistance testing, or other industry standard testing as required to demonstrate acceptable wiring. Owner reserves the right to provide their own additional similar testing:

1. Cost of Contractor's testing included in bid price. Cost of Owner's testing of acceptable installations provided at Owner's expense.
2. Repair installations not passing Contractor's or Owner's quality inspection testing using approved method or replace at no additional cost.
3. Cost of initial testing of wiring not conforming to specified requirements and any retesting of repairs or replacement work deducted from Contract Sum.

3.2 INSTALLATION

A. Motors and Starters

1. Correct, at no additional cost, any misapplied motor or starter combination and improper thermal overload devices for motor starters provided as part of HVAC systems or components, along with damage to other equipment or construction.

2. Motors: Provide motors furnished by equipment manufacturer, specifically manufactured or selected for equipment served; mounted, and installed to provide complete installation that is substantially noiseless in performance under intended use. Replace motors unsatisfactory to Architect with new motor.

3. Starters and Accessories

   a. Provide starters and disconnects for all HVAC equipment. Refer to Equipment Schedules.

   b. Furnish properly tagged and identified devices specifically indicated on "Electric Equipment and Control Schedule" as supplied by HVAC systems suppliers and determine coordinated location and time for delivery of devices.

   c. Provide auxiliary contacts required for temperature controls, interlock with other equipment, alarms, and similar components and applications.

B. Miscellaneous Electrical Wiring included in HVAC systems installations:

1. Provide all control wiring and power wiring for all equipment and associated control devices (including automatic control system) required for HVAC systems and components.

2. Comply with all applicable NEC requirements. Install all electric wiring in accordance with all local and state codes and regulations having jurisdiction.

3. Wiring for Controls: Provide wiring specified in Section 23 09 00 “Instrumentation and Control for HVAC”, for all control devices required for temperature control system and other miscellaneous controls not included in "Electrical Equipment and Control Schedule".

4. Allow sufficient headroom under equipment as directed for each location (unit heater, etc.). Verify space available for each equipment item. Refer to Architect for any correction, discrepancy or suggested change in size of location.

5. Secure all equipment and fixture mountings, wiring devices, and accessories (clips, supports, etc.) to structure with screws, bolts, or similar items; nailing not acceptable.

END OF SECTION 23 05 13

SECTION 23 05 19 - METERS AND GAUGES FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Test plugs.
2. Test-plug kits.

1.3 SUBMITTALS

A. Procedural Requirements: Comply with requirements of Section 01 33 00 “Submittals Procedures” and as modified below.

1. Specified Products: If product to be incorporated into Project is specified by name and product designation in Part 2 below, submit “As-Specified Verification Form” (attached to Section 01 33 00 “Submittals Procedures”) in lieu of “Product Data” identified below in this Article.

2. Equivalent Products or Substitutions: If product to be incorporated into Project is not specified by name and product designation in Part 2 below, comply with all Action Submittal requirements specified below.

B. Action Submittals:

1. Submit all action submittals required by this Section concurrently.
2. Product Data: For each type of product indicated, demonstrating compliance with specifications. Include schedules of locations and ranges proposed.

C. Closeout Submittals:

1. Approved submittal.

a. If “As-Specified Verification Form” submittal is approved, also include product data for all valves used.

2. Include all information required in Section 01 78 23 “Operation and Maintenance Data” for all meters and gauges used. Include wiring diagrams for meter power, signal, and control wiring.

PART 2 - PRODUCTS

2.1 TEST PLUGS AND ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3D instruments Inc.
2. Flow Design, Inc.
3. Peterson Products Co
4. Trerice, H. O. Co.
5. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
6. Weiss Instruments, Inc.

B. Test Plugs:

1. Description: Test-station fitting made for insertion into piping tee fitting.

2. Brass or stainless steel body, NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread with Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber core inserts and gasketed and threaded cap with retainer. Include extended stem on units to be installed in insulated piping.

3. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

C. Test-Plug Kits

1. Furnish one test-plug test kit containing two thermometers, one pressure gauge and adapter, and carrying case. Thermometer sensing elements, pressure gauge, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

2. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

3. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

4. Pressure Gauge: One pressure gauge as specified above with insertion type adapter probe. Dial range shall be 0 to 100 psig.

5. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install test plugs in piping tees in location that allows for ease of insertion of standard test kit probes.

B. Assemble and install connections, tubing, wiring, and accessories between flow-measuring elements, flowmeters and their controllers, and integrate with Energy Management and Control System as specified and as shown, all in accordance with manufacturer's written instructions.

3.3 LOCATIONS

A. Test Plugs and Test Plug Kits:

1. Provide Pressure / Temperature Test Plugs at the supply and return connections to each new air / water heat transfer coil and as noted on the drawings.

END OF SECTION 23 05 19

SECTION 23 05 23 – GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Brass and bronze ball valves.
2. Automatic Flow Control Balancing valves.
3. Manual Balancing Valves
4. Air vent valves

1.3 DEFINITIONS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 SUBMITTALS

A. Procedural Requirements: Comply with requirements of Section 01 33 00 “Submittal Procedures” and as modified below.

1. Specified Products: If product to be incorporated into Project is specified by name and product designation in Part 2 below, submit “As-Specified Verification Form” (attached to Section 01 33 00 “Submittal Procedures) in lieu of “Product Data” identified below in this Article.

2. Equivalent Products or Substitutions: If product to be incorporated into Project is <u>not</u> specified by name and product designation in Part 2 below, comply with all Action Submittal requirements specified below.

B. Action Submittals:

1. Product Data: Submit concurrently for each type of valve proposed, demonstrating compliance with requirements.

C. Closeout Information, for inclusion in Operations and Maintenance Manual:

1. Approved submittal.

a. If "As-Specified Verification Form" submittal is approved, also include product data for all valves used.

2. Include all information required in SECTION 01 78 23 – Operation and Maintenance Data.

3. Receipt: For spare automatic flow control valve cartridges and Differential Pressure Flow Test Kit(s).

4. Valve Chart: Refer to Section 23 05 00 – Common Work Results for HVAC, for details.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

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. Handlever: For quarter-turn valves NPS 5 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. 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.

F. Valve-End Connections:

1. Solder Joint: With sockets according to ASME B16.18.
2. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE AND BRASS BALL VALVES

A. Two-Piece Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Solder or Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 AUTOMATIC BALANCING VALVES

A. Provide each valve with an identification tag attached by chain, factory marked with the zone identification, valve number and flow rate. Valve to be line size.

B. The GPM for the automatic flow control valves shall be factory set and shall automatically limit the rate of flow to within 5 percent of the specified GPM over at least 95 percent of the control range. Select and submit on automatic flow control valves based on flowrates shown on approved submittals.

C. For ½ inch – 2 inch, the flow cartridge shall be removable from the Y- body housing without the use of special tools to provide access for regulator change-out, inspection and cleaning without breaking the main piping.

D. Each valve shall have two P/T test plugs.

E. Construction:

1. For ½" through 2" pipe sizes: Assembly consisting of a de-zincification resistant (DZR) brass, bronze, or A-metal Y-type body, integral full port SS ball and stem ball valve and 'O' ring type union. For all insulated pipe services, provide manufacturer's pre-formed insulation cover to fit each valve, with extended, insulated, non-condensing handle on ball valves.

2. Stainless steel internal flow cartridge body and wear surfaces, with machined threads for spring free height adjustment, permanently marked with the GPM and spring range.

3. Factory leak tested at 100 psi. air under water.

F. Flow Verification:

1. Differential pressure measured across the valve shall be measured for flow verification and to determine the amount of system over heading or under pumping.

G. Design Make: IMI Flow Design Inc.

2.4 MANUAL BALANCING VALVES

A. Provide combination globe-type calibrated flow measuring balance, shutoff, and throttling valve with provision for attaching portable differential pressure meter with each meter connection having positive shutoff access valves equipped with removable insulating cover providing minimum R of 4.5. Rated for 250 PSI at 250 deg. F and provided with calibrated nameplate, ¼-inch drain/purge port, and drip-tight shut off. Similar to "CBV" by Armstrong, "3D" by B & G, or similar products by Tour & Anderson.

B. Threaded, grooved, or flanged ends as required to fit system piping with bronze, A-metal, or dezincification resistant brass body for pipe sizes ½-inch to 2-inches inclusive.

1. Valves designed to allow for presetting of balance points for proportional system balance prior to system start up.

C. Valve Size: As required to meet the Cv indicated on the Drawings, or if not indicated on Drawings, provide the larger of pipeline size or size required to provide maximum 5 ft. water gauge pressure drop at design flow.

D. Read-Out Ports: Include internal EPT inserts and check valves.

E. Adjustment Knob: Includes minimum of four full turns (1440 degrees) from bubble tight shutoff to full open position and includes pre-set feature indicating degree of valve opening including memory position stop and indicator.

2.5 AIR VENTS

A. Manual Air Vents:

1. For All Pipe Sizes In Accessible Locations Only: Bronze body, quarter turn ball valve with minimum ¼-inch discharge and inlet connections. Provide collection chamber at inlet and ¼-inch tube with return bend on outlet, piped to point of collection.

2. For Terminal Units In Accessible Locations: Bronze or brass body and non-ferrous internal parts, 150 PSIG working pressure, 225 deg. F operating temperature. 1/8-inch MNPT inlet connection. Coin or key operated, supply three keys minimum to owner. Similar to “Model 4V” by Bell & Gossett.

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. Do not attempt to repair defective valves; replace with new valves.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Install isolation valves with unions at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. If valves with specified CWP ratings are not available, the same types of valves with higher CWP ratings may be substituted.

C. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 inch and Smaller: Threaded or solder joint ends.

3.3 GENERAL DUTY VALVE SCHEDULE

A. Unless otherwise specifically indicated elsewhere, use the following:

B. Hydronic Flow Shutoff Service:

1. 2 inch and smaller: Full Port Ball Valves

C. Flow Adjustment and Balancing:

1. Provide line size manual adjustment balancing valves for service on terminal units scheduled for 1 GPM flow or less.

2. Provide line size automatic flow control balancing valves for all individual terminal loads. Size valve flow cartridges based on approved equipment submittal flow rates where different from that scheduled. Include in contract changing cartridges on 10% of automatic flow control valves to some different flow as required during TAB and system commissioning work. Turn over original cartridges which have been changed, or the unused portion of the 10% extra, to the Owner with receipt.

3. Select final flow based on approved submittals, not on flow indicated on contract documents.

D. Hydronic System Drain Service: Provide drain valves at all low points as required for complete system drainage.

1. 2 inch and smaller service: Provide ¾ inch full port ball or globe valves, with ¾ inch hose thread end and chained cap.

E. Hydronic System Air Venting:

1. Manual vents: provide standard or full port ball valve, minimum 1/4” NPT; ½” NPT on 4” and larger piping.

2. Equipment Air Vents:

a. Provide High Capacity Automatic Air Vent above each air and air/solids separator.
b. Boilers: Provide High Capacity Automatic Air Vent.

3.4 VALVE INSTALLATION

A. When installing solder-joint end valves, protect valve body from soldering heat using water soaked rags or other heat sink method as required to avoid valve damage. Leaking stems or seats on solder-joint end valves shall be subject to immediate replacement with new valve.

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 and handle movement.

E. Install all Automatic Air Vents above manual vent assembly described below, with discharge piped to point of collection - for glycol venting, pipe discharge to glycol feed station as shown, or if not shown to minimum 1 quart clear plastic container, secured and removable for service.

1. Coin vents may be connected directly to equipment served.

3.5 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.

END OF SECTION 23 05 23

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes

1. Hangers and supports for (but not limited to) following components:

   a. Piping hangers and supports
   b. Duct hangers and supports
   c. Equipment hangers and supports

2. Roof mounted supports and equipment penetrations including (but not limited to):

   a. Roof curbs.
   b. Pipe curb assembly
   c. Equipment support rails
   d. Pipe and duct supports

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Provide corrosion resistant construction as described below for hangers, hanger rods, supports, fittings, hardware, etc, unless otherwise noted or approved. Note that not all products described below are available in corrosion resistance as required for all applications listed – select appropriate corrosion resistant products as required. Multiple conditions may apply, in which case the more corrosion resistant construction is required:

1. General purpose indoor: ASTM B-633 Fe/Zn 25 minimum zinc plated fasteners, ASTM B-653 G90 minimum sheet steel, factory baked enamel paint, or anodized.

2. In contact with copper: Copper plated for size identification and felt lined or plastic coated.

3. In contact with aluminum: Same aluminum alloy as equipment or 300 series stainless steel. 300 series stainless steel fasteners.

4. Outdoors, in crawl spaces, manholes, pits, and below grade: 300 series stainless steel or post-fabrication (after forming, welding, drilling, etc.) ASTM A-153 hot dipped galvanized steel, minimum coating thickness 3 mils.

5. Miscellaneous fabricated custom supports, anchor bases, etc..: painted in accordance with Section 23 05 00 "Common Work Results for HVAC".

6. Other special conditions: where noted on drawings, provide materials of special temperature, corrosion resistance, or other properties, as required for durable and safe performance.

B. Allowable Working Loads:

1. Use only manufacturer's load rated hangers, supports, and fasteners designed and rated for the intended service.

2. Do not load connectors, hangers, or supports to more than the manufacturers′ recommended working load or the following:

a. Use a safety factor of 5:1 minimum with respect to manufacturers published ultimate shear strength.
b. Use a safety factor of 10:1 minimum with respect to manufacturers published ultimate tension or pull-out strength.

C. 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, service loads, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product literature, technical specifications, and other data required to demonstrate compliance with specified requirements for following components:

1. Hangers and supports
2. Miscellaneous components

B. Shop Drawings: Submit intended custom support construction for approval.

C. All supports, etc., shall meet the approval of the Architects / Engineers. Submit shop drawings showing fabrication and installation details including calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.

1.6 QUALITY ASSURANCE

A. Comply with applicable requirements of following standards for all hangers and supports:

1. MSS-SP-58 Pipe Hangers and Supports – Materials, Design, and Manufacture.
2. MSS-SP-69 Pipe Hangers and Supports – Selection and Application.
3. ANSI / ASME Code for Pressure Piping B 31.1
4. ASTM standards for corrosion resistant Zinc coatings.
5. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
6. UL 203 Standard for Pipe Hanger Equipment and Fire Protection Service
7. Metal Framing Association MFMA-2
8. ANSI/ NFoPA NDS - National Design Specification for Wood Construction
9. SMACNA – Sheet Metal and Air Conditioning Contractor's National Association, Inc.

PART 2 - PRODUCTS

2.1 GENERAL

A. For convenience, details and specifications have been based on product types as defined in MSS SP-58 and 69 where applicable, and, where not applicable, catalog numbers shown have been based on products by the listed manufacturers.

2.2 PIPING ATTACHMENTS

A. Individually Suspended Horizontal Rigid Piping or Tube Attachments:

1. Band type:

   a. 1-1/4 inch diameter pipe size and less only.
   b. Formed steel loop overlapped at top with rod sized hole or insert nut. With or without side insert closure.
   c. MSS SP-58 type 5, 6, or 10.

2. Clevis type:

   a. Any size pipe or tubing.
   b. Formed steel bands top and bottom connected by sheer bolt.
   c. MSS SP-58 type 1.

3. Provide products by one of the following manufacturers:

   a. B-Line Systems, Inc., Highland Illinois, or equal
   b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
   c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

B. Supported from below Horizontal Rigid Piping or Tube Attachments:

1. Split Ring type:

a. 1-1/4 inch diameter pipe size and less only.

b. Cast malleable iron split ring with steel pivot and bolt, cast boss on one side threaded for standard rod or pipe attachment. Designed to accommodate minimal longitudinal movement only.

c. MSS SP-58 type 12.

2. Provide products by one of the following manufacturers:

a. B-Line Systems, Inc., Highland Illinois, or equal
b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

C. Group Supported or Suspended (Trapeze) Horizontal Rigid Piping or Tube Attachments (Common Support Beam):

1. Support frame or trapeze beam of load rated brackets or channel strut product.

2. U-Bolt type:

a. Any size pipe or tubing.

b. Insulation support system rests directly on beam or shim, with U-bolt or split strut clamp upper restraint. Designed to accommodate minimal longitudinal movement only.

c. U-bolt MSS SP-58 type 24, Strut clamp similar to B-Line “B-2000” series.

3. Provide products by one of the following manufacturers:

a. B-Line Systems, Inc., Highland Illinois, or equal
b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

D. Individual Vertical Rigid Piping and Tube Attachments:

1. Split Ring type:

a. 1-1/4 inch diameter pipe size and less only.

b. Cast malleable iron split ring with steel pivot and bolt, cast boss on one side threaded for standard rod or pipe attachment. Designed to accommodate minimal longitudinal movement only.

c. MSS SP-58 type 12.

E. Piping Insulation Protection Systems:

1. Pipe Insulation Shields:

a. One Piece:

1) Formed steel, minimum 18 gauge thickness, longer of 2 times diameter or 12-inch long minimum, and 180 degree circumference, sized for insulation thickness.

2) MSS SP-58/69 type 40.

2. Type “A” Insulation Protection System:

a. 1” piping and smaller only.
b. Provide one piece or two piece sliding shield as required by distance from piping anchors.

3. Type “B” Insulation Protection System:

a. 1¼” through 8” heating piping only.

b. Provide one piece or two piece sliding shield as required by distance from piping anchors.

c. Pipe Support Insulation: High density (20 pcf). molded fiberglass blocks consisting of fiberglass wool and urea-phenolic resin cured binder. Provide number and size of support blocks as required to limit deflection to 1% and avoid long-term damage to vapor barrier, and as required for pipe size and insulation thickness, in accordance with manufacturer’s written guidelines and project details. Seal cut in piping insulation vapor barrier using manufacturer’s recommended matching tape. Similar to AHAMFAB H-Block" by ICA

4. Provide products by one of the following manufacturers:

a. B-Line Systems, Inc., Highland Illinois, or equal
b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
c. ICA Inc.; Lehighton, Pennsylvania, or equal.
d. Buckaroos, Inc.

2.3 DUCT ATTACHMENTS

A. Per SMACNA Duct Manual standards for size, height, and location of ductwork, and as noted below.

1. Materials and corrosion resistance as listed above.

2. SMACNA load tables allow for no external loads on duct: provide for 200 lb external load on all duct hangers and supports. Increase hanger and support sizes from SMACNA tables accordingly:

   a. Minimum band size 20ga. x 1 inch.
   b. Duct 48" wide and larger; provide trapeze style support of metal channel framing or angle iron, suspended from threaded rods.

3. Hanger bands to extend down sides and turn under bottom 1 inch minimum for all duct sizes. Minimum (2) #10 sheet metal screws per hanger (one each on side and bottom), (2) screws minimum on sides for duct over 12 inches tall, 12 inches on center max.

4. Round exposed duct: hang from twin half round bands and rods, or as otherwise detailed.

2.4 BUILDING ATTACHMENTS

A. Structural Steel Connectors:

1. C-Clamp style:

   a. FM approved, U.L. listed, steel or malleable iron C-clamp with hardened set screw and lock nut, tapped for rod size, typically eccentrically loads structure.
   b. Hanger rod bypasses structure: MSS SP-58 type 19.
   c. Hanger rod in line with set screw: MSS SP-58 type 23.

2. Center Loading Beam and Channel Clamp Style:

   a. Forged or formed steel or malleable iron construction, beam clamps with connection for concentrically loading structure, of types as required by loading and configuration.

   b. MSS SP-58 types 21, 27, 28, 29, and 30.

3. Pivoting or Adjustable Connection Style:

   a. Structural welding lug with forged steel clevis, side beam bracket, or other appropriate pivoting beam clamps as required for sloped steel.
   b. Use for sloped steel, where thermal movement requires pivot, where seismic controls requires non-moment building connection, and elsewhere as required.
   c. MSS SP-58 types, 21 or 22 with 16 or 17, 34, 57 with 14, etc...

4. Provide products by one of the following manufacturers:

   a. B-Line Systems, Inc., Highland Illinois, or equal
   b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
   c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

B. Existing Concrete Connectors

1. Self-energizing tapered expansion bolt/sleeve: GSA specification FF-S-325, Group II, Type 3, Class 3, UL Listed, FM approved, complete with split expansion sleeve, washer, and hex head nut; similar to "Rawl Lok/Bolt" by Rawlplug.

2. Dual-Interlocking Expansion Wedge Stud: GSA specification FF-S-325, Group II, Type 4, Class 1, UL Listed, FM approved, complete with split expansion sleeve, washer, and hex head nut; similar to "Rawl-Stud" by Rawlplug.

3. Dual-Interlocking Expansion Wedge Threaded Rod Anchors: UL Listed, FM approved, complete with split expansion sleeve; similar to "Rod Hanger Wedge Anchor" by Rawlplug.

4. Provide products by one of the following manufacturers:

   a. Hilti, Inc.; Tulsa, Oklahoma, or equal
   b. Ramset/Red Head; Michigan City, Indiana, or equal
   c. Rawlplug Co. Inc.; New Rochelle, New York, or equal.

2.5 ROOF MOUNTED SUPPORTS

A. Roof Curbs: Double shell, galvanized steel, welded and painted, 1-1/2 inch minimum thickness, with pressure treated wood blocking, braced and fully insulated with rigid fiberglass insulation 3 PCF. Includes gasket at top of curb for airtight seal between curb and ventilator or fan. Provide raised cant, recessed, or flanged curb bottom to suit roof construction and insulation.

1. Steel Thickness: 20 gauge up to 36 inches, 18 gauge 38 to 72 inches, and 16 gauge over 72 inches. Provided with reinforcing and heavier gauge as required to adequately support weight load on curb; coordinate exact size with specified equipment.

2. Minimum height of curbs above finished roof:

   a. 14 inches for curbs supporting exhaust and relief air equipment.
   b. 24 inches for curbs supporting intake of fresh air equipment.

3. Provide with pressure treated blocking, through bolted to structure with stainless steel fasteners, as required bringing base of curb into proper plane for installation. Blocking minimum width to be no less than blocking height. Refer to Division 1 section "Roof Rough Carpentry" for additional details.

4. Provide products by one of the following:

   a. Pate or equal
   b. Con-Fab or equal
   c. Thy-Curb or equal

B. Pipe Curb Assembly: Similar to Roof Curb specified above, equipped with fully welded curb cap top cover of heavy gauge aluminum (12ga), galvalume (16ga), or stainless steel (16ga) construction with integral curb counter flashing, raised flashing collars with replaceable neoprene pipe boot counter flashing secured with stainless steel clamps, size and number of pipe and conduit openings as required. Similar to Pate PCA curb with PCC-C custom curb cap package.

1. Provide products by one of the following:

   a. Pate or equal
   b. Con-Fab or equal
   c. Thy-Curb or equal

C. Equipment Support Rails: Double shell galvanized steel, 14 gauge minimum, fully welded with solid bottom and ends. 2 inch x 8 inch treated wood top blocking, minimum 12 inches high above finished roof, minimum 2 inch turned out flange at bottom, C-channel top cap counter-flashing over blocking. Length to be the longer of 12 inches longer than equipment served or extended past equipment to next building structural support member, factory certified for weight of intended equipment at spacing of structure below, with reinforcement and heavier gauge as required. Units longer than eight feet may be field spliced with bolts and splice plates. Provide galvanizing paint at welds and field splices. Include top cap and integral base with raised cant where required. Provide flanged curb bottom to suit roof construction and insulation.

1. Similar to custom "ES-5A" by Pate.

2. Provide products by one of the following:

   a. Pate or equal
   b. Con-Fab or equal
   c. Thy-Curb or equal

D. Non roofing penetration exterior duct supports:

1. Install per manufacturers recommendations, and as required to maintain roofing warranty. In general, assume installation on loose laid pad of PVC or EPDM reinforcement compatible with roofing, at least one half inch thick and 4 inches larger than support stand base. Provide base sizes load rated for distributing the supported weight at less than two pounds per square foot. Include snow load as shown on code compliance drawings. Provide detailed duct support layout drawings and support size / weight / roof loading calculations in submittal for all non roofing penetration exterior duct supports.

2. Provide loose laid support stands with structural UV stabilized plastic (polypropylene, polycarbonate, FRP) or stainless steel deck base, with socket securing Hot Dipped galvanized or Stainless Steel channel duct support superstructure. Include mechanically bolted support angle clips, and cross member channels for both gravity support and uplift resistance. All fasteners to be stainless steel. Provide with radiused edges to protect roofing, drainage holes, and bolt down holes as required by seismic restraint system.

3. Sliding clamped height adjustment supports, adjustable as required to achieve duct slope and roof clearance required.

4. Similar to “PPH-D Enclosed” by PHP. Provide products by one of the following:

   a. B-Line Systems, Inc., Highland Illinois, or equal
   b. RTS by Eberl Iron Works, Buffalo, NY, or equal
   c. Miro Industries, Inc., Murray, Utah, or equal
   d. Portable Pipe Hangers (PHP) Systems and Design, Houston, Texas, or equal

E. Non roofing penetration pipe supports:

1. Install per manufacturers recommendations, and as required to maintain roofing warranty. In general, assume installation on loose laid pad of PVC or EPDM reinforcement compatible with roofing, at least one half inch thick and 4 inches larger than support stand base. Provide base sizes load rated for distributing the supported weight at less than two pounds per square inch. Provide detailed piping support layout drawings and support size / weight / roof loading calculations in submittal for all non roofing penetration pipe supports.

2. 2 inch nominal and smaller pipe:

   a. Loose laid pipe support stand with structural UV stabilized plastic (polypropylene, polycarbonate, FRP) deck base / roller housing, with load rated roller saddle running on nylon or SS bearing shaft. Provide with drainage holes, and bolt down holes as required by seismic restraint system.

   b. Provide matching height adjustment spacers to achieve pipe slope required.

   c. Manufacturer load rated as required.

   d. Similar to “Pillow Block Pipestand Model 3-R” by Miro Industries, SS8-R by PHP.

3. Provide products by one of the following:

   a. B-Line Systems, Inc., Highland Illinois, or equal
   b. RTS by Eberl Iron Works, Buffalo, NY, or equal
   c. Miro Industries, Inc., Murray, Utah, or equal

F. Portable Pipe Hangers (PHP) Systems and Design, Houston, Texas, or equal

2.6 EQUIPMENT SUPPORTS

A. Provide custom designed hangers and supports to properly and resiliently support all contract equipment as required by special circumstances encountered. Suspend from above or support from below as shown on drawings and as required.

B. Use structural carbon steel plate and shapes, secured by welding or bolts as required.

C. Use load rated fasteners full size of the component attachment points unless specifically requested and approved otherwise.

D. Provide lateral bracing as required minimizing potential for sway.

E. Fabricate as required to transmit loads and reaction forces to structure, in accordance with applicable details and layouts shown on Drawings, and as approved by Architect. Submit load calculations and fabrication details for approval for all such supports including verified coordinated dimensions, weights, etc., of mechanical component, support component, and building structure proposed.

2.7 MISCELLANEOUS COMPONENTS AND ACCESSORIES

A. Threaded Rods, Bolts, Nuts, Washers, Metals, Hardware, and Miscellaneous Assembly Components:

1. Provide manufacturer's load rated fasteners with size, strength and corrosion resistance as required for the application.

2. Rods, bolts, machine screws: rolled forged ANSI B1 Class 2A or better thread, bolts and screws with heads as required by the application, length as required for full thread engagement of but minimal projection past receiving connector including building attachment, (double) nuts, equipment attachment, etc.

3. Nuts: heavy pattern where space permits and where subject to repeated operation, ANSI B1 Class 2B or better thread.

4. Washers: US pattern where space permits, SAE pattern otherwise, with toothed or split lock washer when attached to equipment with moving or vibrating parts.

5. Sheet metal screws: self drilling, thread forming, hardened steel (hardened SS as required), load rated screws with hex heads designed for power driving

6. Structural Steel: ASTM A 36/A 36M, carbon-steel, black and galvanized, and/or series 300 Stainless Steel plates, bars, angles, channels, and other shapes in thickness and size as required for load.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which hangers and supports are to be installed and notify Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. When Contractor confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Contractor.

2. Identify any discrepancies between specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work required by discrepancies after installation at Contractor's expense.

3.2 GENERAL INSTALLATION

A. Provide complete hanger and support systems for piping and ductwork systems and equipment, including all necessary attachments, fasteners, threaded rods, bolts, miscellaneous hardware, and associated work as required.

B. Provide specified products, installed in accordance with applicable sections of this specification, in accordance with the manufacturer's recommended installation instructions, and as detailed on the Drawings.

C. Support pipe, duct, and equipment from the building structure.

1. Provide approved miscellaneous support structure as required to attach hangers and supports to building structure in conformance with all applicable standards and related specification sections.

2. Do not use chain, perforated hanger strapping or band, wire hangers, or kinked, bent, or otherwise damaged hangers and supports.

3. Do not support one pipe from another, one duct from another, pipe from duct or equipment, or any similar combination.

4. Install lateral bracing with pipe hangers and supports as required to prevent swaying.

5. Provide special hangers and supports as shown on the drawings, as required to suit existing conditions, and as required for proper installation of equipment.

D. Load Distribution: Install hangers and supports so that live and dead loads and stresses from movement will not be transmitted to connected equipment.

3.3 PIPE HANGER AND SUPPORT INSTALLATION

A. Comply with MSS SP-58 and MSS SP-89 and as specified below. Install hangers, supports, clamps, and attachments as required properly supporting piping from the building structure.

B. Trapeze Pipe-Hanger Installation: 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 manufactured slotted channel system or structural shapes selected for loads being supported.

C. Size piping attachments for insulated piping to fit outside insulation. Size piping attachments for un-insulated piping to fit outside diameter of pipe.

D. 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. Provide for slope of trapeze supported piping systems with adjustable individual piping attachments.

E. Accommodate thermal movement of piping systems.

1. 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.

2. Provide rods of sufficient length for ample swing. Hang rods from high points to allow maximum swing.

3. Hang piping so that rods are vertical at the design temperature.

4. Where length of rod and thermal expansion combine to cause more than 4 degrees angular movement of rod (or 1 inch lateral movement in a 12 inch rod), provide suitable linkage to permit swing and limit rods to tensile loading only, or, provide pipe roll.

5. Where length of rod and thermal expansion would combine to cause more than 10 degrees angular movement of rod (or 2 inch lateral movement in a 12 inch rod), provide pipe roll.

F. Pipe Hangers and Supports Spacing (Maximum):

1. Provide hanger or support as close as possible to and within 24 inches of any elbow.

2. Provide hanger or support on branch pipe within 24 inches of main at takeoff / tee.

3. All Horizontal / Sloped Heating and Cooling Piping Systems:

Piping Material		Maximum spacing of hangers
a.	PVC and CPVC ¾ in. and smaller	3 ft
b.	PVC and CPVC 1 in. and 1-¼ in	4 ft
c.	Copper ¾ in. and smaller	5 ft.
d.	Copper 1 in. and 1-¼ in.	6 ft.

3.4 ROOFTOP SUPPORT INSTALLATION

A. Rooftop Supports for Piping and Ductwork:

1. Non-roofing penetration supports:

a. Install per manufacturers recommendations, and as required to maintain roofing warranty. In general, assume that cleaning area of roofing at each support is required with installation on loose laid pad of PVC or EPDM reinforcement compatible with roofing, at least one half inch thick and minimum 4 inches larger than support stand base.

b. Attach supports to roof as required for wind, and thermal movement control with compatible rooftop fasteners through holes drilled in bottom of pipe stand pitch pan at time of installation. Fill pitch pan with asphalt material or cement as directed to seal areas around fasteners watertight.

c. Center supports beneath pipe so cradle allows pipe to be squarely over and through cradle pipe stand.

d. Adjust to desired height insuring level platforms, level horizontal bars, proper longitudinal pitch for pipe and duct, and even load distribution among all supports.

e. Set equipment in support without dropping or causing undue impact. Assemble platform grating and secure to superstructure.

f. Assemble piping restraints and make final adjustments to alignment and level.

B. Roof Curbs, Pipe Curbs, and Equipment Support Rails:

1. Maintain existing roof warranties. Contractor is responsible for the installation of all Roof Curbs, Pipe Curbs, and Equipment Support Rails for their equipment complete. Employ the services of a qualified subcontractor specializing in roofing work and certified by the carrier of all new or existing roofing warranties to perform warranty compliant roofing work as required for this project. Employ the services of a qualified subcontractor specializing in structural work to perform structural roof support work as required for this project. Use their services to cut roof openings, provide structural support and installation of Roof Curbs, Pipe Curbs, and Equipment Support Rails, and to patch roofing cuts complete. Refer to SECTION 01 73 00 “Execution” for additional requirements and procedures for cutting openings in existing roofs and roof decks.

   a. If existing roofing is out of warranty, provide minimum two year warranty for roofing work of this contract.

2. Provide larger of curb height scheduled on Drawings or as recommended by equipment manufacturer, but not less than 12 in. above finished roof. Refer to required installation details and provide additional curb height where finished roof surface is above curb mounting flange.

3. Provide all roof curbs required for all rooftop-mounted equipment in Contract.

   a. Provide structural support for roof deck around all roof curbs and roof deck penetrations 12 inch x 12 inch and larger, unless specifically indicated otherwise elsewhere on the Contract Documents. Align support frame with inner edge of curb. Refer to drawings for additional support details around roof openings.

   b. Bolt curbs through blocking to structure with stainless steel fasteners, as required for seismic and wind movement control.

   c. Verify exact size and location and set and secure unit to roof.

d. Set and secure curb or support level as required by manufacturer of equipment served and as required by the installation details of the wind restraint system. Provide tapered shims as required up to 3-1/2 inches thick. If structure slopes more than 3-1/2 inches over length of curb, provide sloped curb to match structure so as to minimize shims. Provide corrosion-resistant fasteners as required to secure curbs to deck or structure, coordinate with subsequent roofing requirements.

e. Coordinate roof openings and set and secure curbs in ample time so as to avoid delay in construction schedule.

f. Coordinate in curb access and rooftop equipment sound transmission mitigation:

1) Coordinate roof deck removal within curbs in all cases with Architect, Owner, Construction Manager and all affected trades as required to optimize access and sound transmission prevention.

2) Coordinate special circumstances requiring exceptions to above with Architect and equipment manufacturers.

g. Prevent water entry into building. Provide roofing work as required to flash curbs. Provide counter flashing and gaskets with curb mounted equipment as required to keep water from entering curb. Provide temporary caps as required until permanent installation is made.

END OF SECTION 23 05 29

SECTION 23 05 43 – MECHANICAL VIBRATION AND MOVEMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes mechanical movement controls for all mechanical equipment and components, piping, and duct work provided or modified as a part of this Project and as noted on the drawings, whether movement is from sound, vibration, thermal, or other sources including (but not limited to):

1. Vibration isolation hangers and mounts for equipment, piping, and ductwork.
2. Flexible piping and flexible piping connections.

1.3 DEFINITIONS

A. IBC: International Building Code.
B. ICC-ES: ICC-Evaluation Service.

1.4 PERFORMANCE REQUIREMENTS

A. Provide mechanical sound, vibration, and movement control for all mechanical equipment, piping, duct work, and other components provided or modified as a part of this Project, and as shown on the Drawings. Mount on or suspend from vibration isolators to reduce transmission of vibration and mechanically transmitted sound to building structure. Select vibration isolators in accordance with weight distribution to produce reasonably uniform deflections.

1. Correct any variance or non-compliance with specified requirements in manner directed by Architect.

1.5 SUBMITTALS

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data for the following:

a. Catalog cuts and data sheets on vibration isolators. Indicate rated load, rated deflection, and overload capacity for each device. Annotate to indicate application of each product submitted and compliance with requirements.

b. Catalog cuts and data sheets on components used. Indicate style, material, and attenuation characteristics for each device or product.

c. Schedule of flexibly mounted equipment, referencing drawings by number. Include number, type, and loading of all isolation components.

C. Informational Submittals:

1. Product Certificates:

a. Contractor Statement of Responsibility: Refer to Division 01 Section, “Quality Requirements.”

2. Welding certificates.

D. Closeout Submittals:

1. Field quality-control test reports.

2. Contract Closeout Submittals: Comply with requirements of Section 01 73 00, including submission of operating and maintenance instructions as item in "General Construction Instructions" manual described in that section.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 COORDINATION

A. Coordinate layout and installation of vibration isolation and movement control devices with other construction that penetrates ceilings or is supported by, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control.
3. Mason Industries.

B. Factory Finishes: Provide 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 galvanized 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.

C. Where neoprene is referred to and used in vibration isolation components, it shall be bridge-bearing grade premium neoprene of the durometer hardness grade and size specifically recommended by the design make manufacturer for both maximum vibration isolation and load rated for the specific application.

D. Isolation Mountings

1. Neoprene Mountings: Provide minimum static deflection of 0.35-inch with all metal surfaces neoprene-covered and having friction pads both top and bottom.

a. Bolt holes provided on base, isolated from tapped bolt hole with cap screw on top.
b. Steel frame bases used above mountings to compensate for overhang.
c. Basis-of-Design Product: Mason Industries, Inc.; Type ND or Rails Type DNR.

2. Restrained Neoprene Mountings: OSHPD pre-approved vibration isolation mounts with captive opposed neoprene inserts, minimum static deflection of 0.2-inch.

a. Restraint rated at 2G minimum in all directions.
b. Plated steel frame with base mounting holes, isolated from tapped bolt hole with cap screw on top.
c. Basis-of-Design Product: Mason Industries, Inc.; Type BR.

E. Hangers

1. Neoprene Hangers: Rigid steel frames containing neoprene element.

a. Minimum 1-1/4-inch thick neoprene element on bottom with projecting bushing preventing steel-to-steel contact.
b. Minimum static deflection of 0.20-inch.
c. Boxes not articulated, clearance hole in neoprene element to allow non-moment bearing connection at structural support.

d. Configured for threaded rod, eye bolt, or strap connections as required.
e. Basis-of-Design Product: Mason Industries, Inc.; Type HD.

2. Type A Hangers: Rigid steel frames containing minimum 1-1/4-inch thick neoprene elements at top and steel spring with general characteristics as specified for Spring Isolator above seated in steel washer reinforced neoprene cup on bottom.

a. Neoprene element and cup have neoprene bushings projecting through steel box.

b. Boxes not articulated as clevis hangers nor neoprene element stacked on top of spring in order to maintain stability.

c. Spring diameters and hanger box lower hole sizes large enough to permit hanger rod to swing through 30-degree arc from side-to-side before contacting cup bushing and short-circuiting spring.

d. Include hanger drawing showing 30-degree capability.

e. Basis-of-Design Product: Mason Industries, Inc.; Type 30N.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and movement control devices for compliance with requirements for installation tolerances and other conditions affecting performance. Notify affected Prime Contractors and Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

2. Identify any discrepancies between specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work required by discrepancies after installation at Contractor's expense.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 VIBRATION, SOUND, AND THERMAL MOVEMENT CONTROL INSTALLATIONS

A. Install all vibration isolators in strict accordance with manufacturers written instructions and all submittal data. Coordinate installation to avoid rigid contact with building.

1. Install without any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

2. Do not make rigid connections between equipment and building structure that degrade noise and vibration control system specified.

3. Do not install any equipment, piping, duct, or conduit with rigid connections to building or other support structure unless no isolation is specifically called for. "Building" includes, but is not limited to, roof deck, floor/ceiling/roof slabs, beams, joists, columns, studs and walls.

4. Identify any conflicts which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions to Architect / Engineer prior to installation. Corrective work required by conflicts after installation at Contractor's expense.

5. Correct, at no additional cost, all installations deemed defective in workmanship and materials at Contractor's expense.

3.3 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 23 05 43

SECTION 23 05 48 – MECHANICAL WIND LOAD CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control of mechanical component movement resulting from wind generated loads. Controls for all mechanical equipment and components, piping, and duct work provided or modified as a part of this Project and as noted on the drawings are included.

B. Considering that the basis of design equipment is not always provided for project work, and that not all acceptable “equals” are the same weight, size, center of mass, cross section profile, and other characteristics that affect the wind load calculations, these detailed calculations are to be performed once specific to the approved mechanical equipment as part of a delegated design as detailed below.

C. Control of mechanically generated vibrations and sounds and control relative movement of components due to thermal expansion and contraction are covered in Section 23 05 43 “Mechanical Vibration and Movement Control”.

1. Securing those vibration and movement control components against wind loads is covered in this section.

D. Specialized movement control components specified in this section include:

1. Wind restraints and snubbers.
2. Wind restraint construction requirements.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the wind loads specified."

D. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the wind loads specified and the unit will be fully operational after the wind event."

E. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 RESTRAINT PERFORMANCE REQUIREMENTS

A. Provide restrained mechanical sound, vibration, and movement control for all mechanical equipment, piping, duct work, and other components provided or modified as a part of this Project, and as shown on the Drawings. Coordinate restraints with vibration and movement control system described in section 23 05 43 “Mechanical Vibration and Movement Control”.

B. Provide complete design, detailing, and design documentation of all wind restraints required and exceptions allowed, for all mechanical equipment, piping, duct work, and other components provided or modified as a part of this Project and as shown on the Drawings, allowing all restrained components to withstand wind load specified. Design shall be performed by a qualified licensed and registered professional engineer, with all drawings, calculations, and design analysis data signed and sealed by the engineer responsible for their preparation.

C. Design in accordance with the mechanical component wind design requirements of the Building Code of New York State and applicable local codes. Calculations and design to be based on the following criteria.

D. Wind-Restraint Loading:

1. Basic Wind Speed: 90 mph

2. Building Occupancy Category: III.

3. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

1.5 SUBMITTALS

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Closeout Submittals:

1. Field quality-control test reports.

2. Contract Closeout Submittals: Comply with requirements of Section 01 73 00, including submission of operating and maintenance instructions as item in "General Construction Instructions" manual described in that section.

1.6 COORDINATION

A. Coordinate layout and installation of wind load control devices with other construction that penetrates ceilings or is supported by, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 WIND LOAD RESTRAINT DEVICES

A. Wind load restraint devices may include all wind restraint devices listed above as approved and as included in the delegated design wind restraint calculations submittal, as well as any other custom wind restraint devices designed and approved by delegated design engineer which are required above and beyond specified wind restraint system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive wind control devices for compliance with requirements for installation tolerances and other conditions affecting performance. Notify affected Prime Contractors and Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. Examine roughing-in of reinforcement anchors to verify actual locations before installation.

2. Identify any discrepancies between specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work required by discrepancies after installation at Contractor's expense.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 WIND RESTRAINT INSTALLATIONS

A. General Wind Restraint Requirements:

1. Provide complete wind restraint system as specified and as shown and detailed on approved delegated design submittals.

2. Install restraint devices in strict accordance with the approved Installation Quality Control Procedure and other applicable submittal data, using methods approved by an evaluation service member of ICC-ES, OSHPD, or required submittals for component.

3. Strength of Support and Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and wind loads within specified loading limits.

4. Install cables so they do not bend across edges of adjacent equipment or building structure.

B. Equipment Restraints:

1. Snubbers: Install the required number of snubbers on each spring-mounted piece of equipment. Locate snubbers as close as possible to the vibration isolators and bolt to equipment base and supporting structure.

2. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolts and mounting hole in concrete base.

3. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

4. Vibration Isolation Bases: Mount equipment on structural-steel bases or concrete inertia bases.

C. Piping Restraint:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c., or closer as detailed in delegated design.
3. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application.
4. Brace at change of direction longer than 12 feet.

D. Structural Attachments:

1. All welding shall be by qualified welders using qualified procedures.

2. 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.

3. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

4. Wedge Anchors: Protect threads from damage during anchor installation. Install heavy-duty sleeve anchors with sleeve fully engaged in the structural element to which anchor is to be fastened.

5. 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.

6. Set anchors to manufacturer's recommended torque, using a torque wrench.

7. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust air-spring leveling mechanism.

D. Adjust active height of spring isolators.

E. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.4 FIELD QUALITY CONTROL

A. Contractor Requirements:

1. Testing Agency: Engage the services of a qualified Testing Agency to perform Tests and Inspections.

2. Provide access to all places of inspection for representatives Testing Agency(s).

3. Schedule tests with Owner’s Project Representative, and Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.

4. Obtain Architect's approval before transmitting test loads to the structure. Provide temporary load-spreading members as required by the test loads.

5. Perform the following Tests and Inspections:

    a. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
    b. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
    c. Test to 90 percent of rated proof load of device.
    d. Measure isolator restraint clearance.
    e. Measure isolator deflection.
    f. Verify snubber minimum clearances.
    g. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
    h. Prepare test reports and distribute to Owner and Architect.

6. Remove and replace malfunctioning units and retest as specified above.

B. Remove and replace malfunctioning units and retest as specified above.

C. Walk-through with Owner's Project Representative, Professional Engineer responsible for design of wind restraints, and Restraint Manufacturer's Representative to verify installation is in accordance with specifications and submittals**.** Provide manufacturer approval letter and Professional Engineer-stamped letter documenting installation is complete and approved by them as in compliance with Project requirements.

D. Owner's Testing Agency: Will perform inspections and tests as required by applicable codes and insurance regulations. Make any corrections as required to meet Owner's Testing Agency's requirements.

END OF SECTION 23 05 48

SECTION 23 05 53 - IDENTIFICATION FOR HVAC COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Valve tags.

1.3 SUBMITTALS

A. Procedural Requirements: Comply with requirements of Section 01 33 00 “Submittal Procedures” and as modified below.

1. Specified Products: If product to be incorporated into Project is specified by name and product designation in Part 2 below, submit “As-Specified Verification Form” (attached to Section 01 33 00 “Submittal Procedures”) in lieu of “Product Data” identified below in this Article.

2. Equivalent Products or Substitutions: If product to be incorporated into Project is not specified by name and product designation in Part 2 below, comply with all Action Submittal requirements specified below.

B. Action submittals:

1. Submit manufacturer’s data sheets for all proposed products demonstrating compliance with specifications.

C. Closeout Information, for inclusion in Operations and Maintenance Manual:

1. Approved submittal.

a. If “As-Specified Verification Form” submittal is approved, also include product data for all identification components used.

2. Include all information required in Section 01 78 23 “Operation and Maintenance Data”.

3. Valve Chart - Refer to Section 23 05 00 “Common Work Results for HVAC”, for details.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate installation of identifying devices with locations of access panels and doors.
C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Paint: Refer to Division 09.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brimar Industries, Inc. or equal.
2. Campbell International (Ltd.), or equal.
3. Craftmark Identification Systems, Fort Worth, Texas, or equal
4. EMED Company, Inc., Buffalo, New York, or equal
5. Seton Name Plate Company, New Haven, Connecticut, or equal

2.2 LABELS

A. Equipment Labels:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware, or multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

3. Colors:

   a. Brass Labels: black in-filled letters on brass background
   b. Plastic Labels: white letters on black plastic background
   c. Warning Signs: yellow letters on black background.

4. Able to withstand temperatures up to 160 deg F. continuously.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

6. Fasteners: Stainless-steel rivets or self-tapping screws.

7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Equipment Label Content: Include equipment's Drawing designation or unique equipment number and equipment function.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Include Equipment Schedule in Operation and Maintenance Manual.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive. Secure in place with full circumference tape wrap.

C. Pipe Label Contents: Include identification of piping service using abbreviations indicated below, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction (flow direction arrow circumference tape preferred).

2. Lettering Size: In accordance with ANSI 13.1 and as follows:

Outside diameter:	Letter Height:
a. 2” or less	¾”

3. Pipes too small to be directly labeled: provide hanging equipment tag with ½” lettering. Outside diameter indicated is to outside of pipe insulation on insulated piping.

D. Piping Systems: Identify the following systems as indicated:

1. Refrigerant Liquid (RL)
2. Refrigerant Suction (RS)
3. Heating Hot Water Supply (HWS)
4. Heating Hot Water Return (HWR)
5. Condensate Drain (CD)

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Colors: Letter color, black; background color, white.

C. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

D. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

E. Minimum Letter Size: One inch for viewing distances up to 60 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

F. Fasteners: Stainless-steel rivets or self-tapping screws.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

2.5 VALVE TAGS

A. Valve and Hydronic Specialty Identification: Provide 1-1/2-inch diameter brass tags, 0.032-inch minimum thickness, with predrilled or stamped holes for attachment with #16 brass jack chain, factory engraved or stamped with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with black in fill, legend as described below.

1. Stamp "H" and valve number for each main, riser, zone, and branch heating valve.
2. Provide manufacturer’s tags for all automatic balancing fittings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.
B. Locate equipment labels where accessible and visible.

3.3 PIPE IDENTIFICATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. Near major equipment items and other points of origination and termination.
5. Spaced at maximum intervals of 15 feet along each run.
6. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.4 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. Near major equipment items and other points of origination and termination.
5. Spaced at maximum intervals of 15 feet along each run.
6. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

	Item	Color
1.	Refrigerant……..	Dark Green
2.	Hot water supply & return……..	Red
3.	Condensate (drain)……..	Rust Brown

3.5 DUCT LABEL INSTALLATION

A. Stenciled Duct Label Option: Stenciled labels, showing service, size, and flow direction as indicated above, may be provided instead of plastic-laminated duct labels, at Installer's option, for concealed ductwork or if lettering larger than 1 inch high is needed for proper identification because of distance (over ten feet) from normal location of required identification. Stencils shall be crisp and neat with no overspray, drips, runs, or other imperfections visible from normal viewing distance. Refer to Division 09 sections on painting for more information.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

A. Install tags on new valves, hydronic specialties, and control devices in piping systems. Verify existing valve numbers in field and provide valve numbering avoiding duplication of existing numbers.

B. Valve Identification Chart: Refer to Section 23 05 00 “Common Work Results for HVAC” for Valve Identification Chart requirements.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Testing, Adjusting, and Balancing (TAB) Work shall be a joint effort of the Contractor and the TAB Agency, performed with the intention of leaving the systems involved in a properly functioning and balanced flow condition as designed and indicated in the Construction Documents, similar to the "Total System Balance" condition described in the AABC Standard.

1. The division of responsibility for the TAB Work is outlined below. Contractor to perform preparation and ancillary work described below, with the option of subcontracting a portion of their work to the TAB Agency, but the TAB Agency must take sole responsibility for any portion of the preparation or TAB Work defined as the TAB Agency's Work.

2. TAB Agency Work to be performed by a fully qualified independent TAB Agency as described in quality assurance below and as approved by the Architects and Engineers, to be paid for by the Contractor responsible for HVAC Work as a first tier subcontract to their work.

B. Section includes preparation for, and Testing, Adjusting, and Balancing (TAB Work) of HVAC components, equipment, and systems:

1. Contractor Preparation and Participation:

a. Place systems in satisfactory operating condition as detailed below prior to the arrival of the TAB Agency for the specified TAB Work, and notify the TAB agency, Construction Manager, and Engineer in writing when systems are ready for TAB Work.

b. Attend and actively participate in coordination and TAB meetings.

c. Keep TAB Agency apprised of construction schedule as required facilitating TAB agency job site visits prior to concealment of work. Provide overall construction schedule to TAB agency at coordination meetings and TAB meetings, update schedule regularly noting milestones and dates affecting TAB review and work schedule, and provide at minimum 7 calendar days notice prior to concealment.

d. Coordinate and provide mechanical and controls systems operation, revisions, and other ancillary work as required during TAB Work, as detailed below.

e. Make changes as required to create a testable, balanceable system, as recommended by TAB agency but only as approved by the Engineer.

2. TAB Agency Preparation:

a. Review Construction Documents and Coordination Drawings with Engineer, Construction Manager, and Contractor and assist in preparation of submittals, particularly Coordination Drawings, dampers, and balancing valves, by preparing recommendations to Contractor and Engineer on locations of balancing valves, dampers, access doors, test connections, etc., as well as any other special considerations affecting the TAB Work and/or the fabrication or engineering of the systems. Documentation of assistance shall be both by mutually agreed upon notations on the submittals / sheet metal Shop Drawings prior to submittal, and by TAB Agency's letter accompanying submittal, verifying review and TAB Agency approval of the specific submittal.

b. Visit job prior to concealment of work, repeatedly if necessary due to construction scheduling, check work, and advise the Contractor, Construction Manager,]and Engineer on correctness of locations of dampers, access doors, test connections, etc., as well as any other special considerations affecting the TAB work. Advise in writing, copied to the Contractor, Construction Manager, and the Engineer within 3 days of the site visit but in any event before concealment.

C. TAB Work includes:

1. Testing of all mechanical components for performance, calibration, capacity, and other characteristics as outlined below and as required, demonstrating conformance with contract documents and submittals.

2. Adjusting and Balancing of all mechanical components of this project as described in the contract documents, achieving specified air and water flow at all terminal equipment, distribution at lowest noise levels and energy use, and achieving specified thermometer, gauge, and sensor instrument accuracy and calibration, all as outlined below.

3. Documentation, correspondence, data recording, reporting, and demonstration all as outlined below and elsewhere in the contract documents.

4. Coordination with other Contractors, subcontractors, Construction Manager, Owner's Representatives, and Architect / Engineer as required achieving specified TAB results.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.
B. ASHRAE: American Society of Heating, Refrigerating, and Air-Conditioning Engineers
C. Contractor: The entity contracted to perform the HVAC Work described in these contract documents.
D. NEBB: National Environmental Balancing Bureau.
E. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
F. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. TAB: Testing, adjusting, and balancing.
H. TABB: Testing, Adjusting, and Balancing Bureau.
I. TAB Agency: An entity engaged to perform TAB Work who is qualified and approved to do so as described below.

1.4 SUBMITTALS, GENERAL

A. Contractor:

1. Perform no work affecting TAB prior to TAB Agency approval and submission of Pre-Construction Inspection and Testing Report.

2. Prior to submittal of any equipment affecting TAB, review with approved TAB Agency and obtain commentary and approval as described in “Summary” Article. Include TAB Agency review commentary with affected submittals.

3. Immediately upon approval of other submittals, provide the TAB Agency with copies of approved submittals, including Shop Drawings of all hydronic and air systems and equipment requiring balancing.

1.5 ACTION SUBMITTALS

A. Contractor:

1. Within 30 days after award of Contract, submit TAB Agency qualifications proposal for approval.

B. Contractor and TAB Agency:

1. Submit Systems Readiness Reports as described more fully below.

C. TAB Agency:

1. Submit TAB Agency qualifications proposal for approval.

a. Name and contact information of proposed TAB Agency,

b. Documentation that they meet the qualifications specified in "Quality Assurance" Article, Evidence of current TAB Agency and TAB Supervisor Certification, Examples of data forms proposed for each system type showing input cells for this Project’s required data, 3 regional references for comparable recent jobs.

c. List of instruments to be used in testing and balancing, with current certification of all instruments’ calibration on calibration agency letterhead, including the following information:

1) Instrument type and make.
2) Serial number.
3) Application.
4) Dates of use.

5) Dates of calibration.
6) Test data points over range qualified – standards and measured values.

2. Submit Strategies and Procedures Plan: Within 30 days of Architect's approval of TAB Agency, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

3. Submit Preliminary Partial TAB Reports.

4. Submit Certified Final TAB Report.

5. Certified Six Month System Check / Design Condition TAB Report.

1.6 INFORMATIONAL SUBMITTAL

A. TAB Agency:

1. Contract Documents Examination Report: Within 15 days of Architect's approval of TAB Agency, submit the Contract Document Examination Report as specified in Part 3.
2. Include commentary with all Contractor submittals affecting TAB work as described above.
3. Pre-Construction Inspection and Testing Report: Prior to removal of any affected construction.

1.7 QUALITY ASSURANCE

A. TAB Agency, Employee, and TAB Work Qualifications:

1. TAB Agency: Fully certified current member of "Associated Air Balance Council" (AABC), "National Environmental Balancing Bureau" (NEBB), or "Testing, Adjusting, and Balancing Bureau" (TABB), specializing in the adjusting and balancing as specified in this Section of systems as specified and as shown on the Contract Documents, with minimum three years documented experience as a fully certified member, and three current regional references for projects of comparable scope.

2. TAB Field Supervisor: Employee of the TAB Agency and currently certified by AABC, NEBB, or TABB as a Testing, Balancing and Adjusting Supervisor.

3. TAB Technician: Employee of the TAB Agency and currently certified by AABC, NEBB, or TABB as a TAB technician.

4. All TAB Work: Performed by direct employees of the TAB Agency, who are either TAB Field Supervisors themselves, or who are TAB Technicians working under the direct supervision of a TAB Field Supervisor.

B. Conform to basic procedures and methods outlined by applicable publications in testing and balancing of air and water systems by the following organizations, and as modified by this document:

1. Associated Air Balance Council (AABC).
2. National Environmental Balancing Bureau (NEBB).
3. Testing, Adjusting, and Balancing Bureau (TABB).
4. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
5. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
6. Individual manufacturer requirements and recommendations.

C. TAB Conference: After approval of the TAB Strategies and Procedures Plan and before TAB Work begins, schedule and attend a meeting with Architect, and Construction Manager, at their convenience, to develop a mutual understanding of the details. Require the participation of the TAB Field Supervisor and Technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

   a. Review the Contract Documents examination report.
   b. Review the TAB Strategies and Procedures Plan.
   c. Review the System Readiness Report.
   d. Coordination and cooperation of trades and subcontractors.
   e. Coordination of documentation and communication flow.

D. TAB Report Data Forms: Follow AABC, NEBB, TABB, or SMACNA format as modified by the data requirements of this Project, subject to submittal approval.

E. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

F. Instrumentation Type, Quantity, Accuracy, and Calibration: Instruments as described in ASHRAE 111, Section 5, "Instrumentation.", all currently certified as calibrated by a NRTL or NVLAP in accordance with Division 01 Section “Quality Requirements”.

G. Contractor: maintain qualified personnel at Project for system operation, trouble-shooting, making system changes, and performing mechanical adjustments in conjunction with TAB procedures.

1.8 PROJECT CONDITIONS

A. Environmental Requirements: Accomplish TAB work under appropriate outdoor temperature conditions. Coordinate with Temperature Controls Contractor to manipulate HVAC systems as required to simulate design conditions for load testing boilers, chillers, terminal load equipment, and similar portions of the systems.

B. Concealed Conditions: Before concealment of systems, verify and advise on type and location of balancing devices and test points. Make changes as required to balancing facilities.

1.9 COORDINATION AND SCHEDULING

A. Refer to Division 00 and Division 01 for overall project sequencing and scheduling requirements. All HVAC work required for, and, approvable balancing in accordance with the requirements of this section is required to be complete before Contract Substantial Completion.

1. Contractor:

   a. Assure that all HVAC work required to properly and completely test and balance the various systems, occurs in a timely fashion coordinated with the overall project schedule as required, with final readiness report delivered at minimum two calendar weeks prior to contract scheduled Substantial Completion Dates.

   b. For HVAC Work required to be performed simultaneous with TAB Work, coordinate schedule with TAB agency and provide qualified staffing as required keeping pace with TAB agency personnel.

   c. For phased projects prepare phased partial readiness for TAB coordinated with TAB Agency as required meeting the Owner's construction schedule.

   d. Coordinate and report partial systems readiness in writing to TAB agency, Construction Manager, and Engineer, to allow TAB work to proceed in an orderly fashion.

2. TAB Agency:

   a. Assure that all TAB Work and all subsequent reporting on same occurs in a timely fashion coordinated with the overall project schedule prior to contract scheduled Substantial Completion Dates.

   b. For HVAC Work required to be performed simultaneous with TAB Work, coordinate schedule with Contractor and provide qualified staffing as required to complete TAB work and reporting within one calendar week of partial phased work readiness and within two calendar weeks of final HVAC systems readiness for TAB.

B. Tab Agency: Coordinate, schedule, and run a TAB Strategies and Procedures meeting, with Contractor, Owner, Architect, Engineer, Controls Subcontractor, and Commissioning Agent all present. Provide TAB Plan and agenda in advance, and produce and distribute meeting minutes.

C. Contractor and TAB Agency: Perform all examination and preparation work required and submit Systems Readiness Report(s) prior to beginning TAB work.

D. Contractor and TAB Agency: After submission of Systems Readiness Report, coordinate and schedule all preparation and TAB work with each other, Owner, Architect/Engineer, Construction Manager, and Commissioning Agent. Notify O/AE/CM/Cx team of all scheduled TAB work test dates and times in writing with at least seven days' advance notice for each visit.

1. Cooperate with other contractors and affected subcontractors as required to provide complete and proper testing, adjusting, and balancing of HVAC systems.

E. Accomplish TAB Work during construction period as soon as the systems are complete enough to perform TAB work. Coordinate with project phases and before Owner takes possession. TAB work and approval of at least partial pencil copy reports is required before Owner takes possession.

F. Multiple visits will be required for phased construction in cooperation with construction schedule, with multiple “pencil copy” submittals of partial TAB reports required promptly as each phase of TAB work is accomplished.

G. Perform balancing for record at final stage when all previously completed sub-systems are checked and re-balanced to design performance.

H. Contractor and TAB Agency: return to the site approximately six months after initial TAB Work is complete to perform system checkup and design condition rebalancing as defined below.

I. Contractor and TAB Agency are subject to recall to site to verify report information before acceptance of the report by the Architect.

J. Contractor: provide 2 additional copies of Shop Drawings and other submittals for all equipment and systems to be tested and balanced to TAB Agency as soon as possible but no later than 60 days prior to scheduled completion of equipment and systems installation.

K. TAB Agency:

1. Verify that Contractor has placed all systems and equipment in satisfactory operating condition as required allowing TAB Work to be properly performed.

2. Cooperate with Contractor and affected subcontractors as required to provide complete and proper testing, adjusting, and balancing of air and water systems.

3. Visit Project prior to concealment of Work and note location of dampers, test connections, and similar items. Record this information, transmit to Contractor, and incorporate on Record Drawings.

4. Coordinate timing of six month system check and design condition TAB Work with weather, Contractor, and Owner.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. TAB Agency: Provide tools, ladders, recording meters, gauges, thermometers, velometers, anemometers, Pitot tubes, inclined gauge manometers, magnehelic gauges, amprobes, voltmeters, psychrometers, tachometers, ultrasonic or other non-intrusive flowmeters, sound meters, and all other instrumentation required to perform specified TAB work. Accurately calibrate all instruments.

1. Make instruments available to Architect to facilitate spot checks during testing and back-checking.
2. Provide additional balancing devices as required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. By TAB Agency:

1. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

2. Visit Site and examine existing systems before construction and new / re-worked systems prior to concealment of construction to check on and advise regarding location of installed balancing devices, such as test ports, gage cocks, thermometer wells, thermometers and gages, flow-control devices, balancing valves and fittings, volume dampers, test connections, etc. Verify that locations of these balancing devices are accessible. TAB Agency shall advise Contractor and Architect of TAB Agency findings by letter.

3. Examine the submittals for HVAC systems and equipment. Verify that proposed equipment can be balanced as specified and as required. Provide commentary on all submittals advising where additional balancing devices are needed or configuration adjustment is desired to facilitate TAB work.

4. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

5. Examine test reports specified in individual system and equipment Sections.

6. Examine manufacturer's equipment performance data including pump and fan curves.

    a. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

B. By Contractor:

1. Examine systems and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections has been performed, and all TAB preparation as described in "Preparation" Article is complete.

3.2 PREPARATION

A. TAB Agency:

1. Prepare and submit a TAB plan that includes the following

    a. Site specific strategies narrative and step-by-step procedures with this project's equipment identified.
    b. Instrumentation to be used.
    c. Forms with specific identification for all equipment.

2. Prepare and submit a blank master Systems Readiness Report to Engineer, Commissioning Agent, and Contractors, with itemized checklists for each individual item to receive TAB Work as appropriate for the equipment, with a column for Contractor indicated status and another two columns with room for TAB Agency and Commissioning Agency commentary itemizing deficiencies discovered and confirming all systems preparation and examination has been properly performed. Include, at minimum, the following checks for each piece of equipment as applicable:

    a. Air side:

        1) Verify required leakage and pressure tests on air distribution systems have been satisfactorily completed.
        2) Duct systems are complete with terminals installed.
        3) Volume, smoke, and fire dampers are open and functional.
        4) Automatic control system dampers are installed, adjusted, and operational, with actuators installed.
        5) Manufacturer's startup checklists have been appended.
        6) Clean filters are installed, temporary media obstructions are available.
        7) Fans are operating, free of vibration, and rotating in correct direction.
        8) Variable-frequency controllers' startup is complete and safeties are verified.
        9) Ceilings are installed.
        10) Windows and doors are installed.
        11) Suitable access to balancing devices and equipment is provided.

b. Hydronic and refrigerant piping side:

1) Verify leakage and pressure/vacuum tests on distribution systems have been satisfactorily completed.
2) Piping is complete with terminals installed.
3) Refrigerant systems are properly evacuated and filled with the correct refrigerant at the right pressure.
4) Manufacturer's startup checklists have been appended.
5) Shutoff and balance valves have been verified to be 100 percent open.
6) Pressure gauges, thermometers, and PT plugs are all installed where and as specified.
7) Suitable access to balancing devices and equipment is provided.

c. Energy Management and Controls System:

1) Pressure, temperature, position, electrical current, and other controls system sensors are installed where and as specified.
2) Control valves, dampers, and variable-frequency controllers' are functioning in accordance with the sequence of operation.
3) Controllers are installed and functioning in accordance with the sequence of operation.

B. Contractor: Before TAB work commences on any portion of the system, and before new system startup, verify that systems are complete and in proper operating condition. Ensure the following:

1. Equipment is operable, in a safe and normal condition, and is of the size and capacity specified in the Contract Documents, bearings are greased, pulleys are aligned and belts properly tight, and equipment with functioning controls is ready for operation. Make any required modifications to systems in advance of the TAB Agency's arrival for that portion of the work.

2. Provide proper equipment start-up as specified, complete with manufacturer's filled out standard published start-up forms.

3. Temperature control systems are operable to the extent required for that portion of the TAB Work. Control valves must at least be installed complete and hand operable. Automatic dampers must be operable and under control. Safety interlocks and controls on HVAC equipment must be properly functional.

4. All motors, and fans have correct rotation.

5. Permanent electrical-power wiring is complete, and proper thermal overload protection is in place for all electrical equipment.

6. All ductwork, air handlers, grilles, registers, and diffusers are installed, complete, and cleaned of dust and debris.

7. All piping, terminal radiation, valves, required pressure taps, and hydronic specialties are correctly installed, complete, operational, and clean.

8. All ductwork, diffusers and registers have dampers where specified, and all hydronic systems have balancing and isolation valves where specified.

9. Duct system leakage has been tested where required and minimized.

10. Hydronic systems have all required vents and drains installed and functional, and are flushed, vented, cleaned, leak free, and filled with specified heat transfer fluid.

11. All manually set dampers (fire, fire/smoke, register, grille, diffuser, and manual volume dampers) operate smoothly and are adjusted open. All automatic dampers have actuators and required linkages installed and rough adjusted.

12. All hydronic systems valves are installed with proper direction of flow and operate smoothly, balancing valves are adjusted open, P-T plugs and gauges are installed and functional where required, two-way control valves are open, three-way valves are properly installed for their intended function of diverting or mixing fluid flows, and service valves are open or closed as required for normal flow.

13. Make preliminary adjustments to airflow patterns of all registers, grilles, and diffusers to obtain uniform space temperatures and air movement free from objectionable drafts and noise.

14. Clean new final design filters are installed everywhere called for.

15. Coil fins are clean and straight.

16. Access doors in ducts are closed and duct end caps are in place.

17. Access doors necessary to reach duct volume dampers, balancing valves, and measuring stations are installed in accessible locations and are operable.

18. As-built conditions are accurately recorded on working as-built drawings, including locations of all access points, manual and automatic dampers, isolation, balancing, and control valves, fittings, and all other items affecting TAB work. Provide copies of these annotated as-built drawings for TAB agency's use during TAB work.

19. As the various portions of the system are completed and become ready for TAB, prepare and submit partial Systems Readiness Reports to Engineer, Commissioning Agent, and TAB Agency, with itemized checklists filled out as appropriate for the equipment to receive TAB Work, indicating status and requesting TAB for that portion of work commence.

    a. Include itemized list of all examination and preparation procedures outlined above and as otherwise required by TAB and Commissioning Agencies' procedures, with initialed dated verification of each item by authorized responsible party.

    b. Promptly report abnormal conditions in mechanical systems or conditions that prevent system balance. If, for any reason, system cannot be properly balanced, report as soon as observed.

20. Report any additional defects or deficiencies observed during performance of TAB procedures.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. In the following TAB procedures portions of Part 3 Execution of this document, the procedures are deemed to be TAB Agency work unless specifically identified as Contractor work.

B. Contractor required assistance and Ancillary Work during TAB Agency Work includes the following general work categories and notes on Contractor Work requirements in subsequent specific procedure descriptions:

1. Maintain mechanically qualified personnel at Site to perform necessary mechanical modifications and adjustments in conjunction with TAB procedures.

2. Operate systems.

3. Provide trouble-shooting.

4. Cut insulation, pipes, ducts, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures. Properly plug all holes. Provide new insulation that matches removed materials, finished in accordance with Division 23 Section "HVAC Insulation."

5. Change air filters as required.

6. Adjust automatic damper linkages so they all operate smoothly and close tightly.

7. Perform necessary controls operations required for TAB procedures.

8. Re-adjust / make final adjustments to registers, grilles, and diffusers in cooperation with Owner and TAB Agency as required to obtain uniform space temperatures and air movement free from objectionable drafts and noise. As this affects system pressure drops, this must be completed before final airflow balancing.

9. Make any required additions or changes in types, locations, etc., of balancing equipment.

10. Provide other mechanical adjustments as required in conjunction with TAB procedures.

11. Leave system in proper working order, closing access doors, closing doors to electrical switch boxes and securing cover plates, restoring thermostats to specified settings, restoring systems to automatic operation as required, replacing ceiling tiles, plugging access ports and repairing insulation, cleaning, etc...

C. Tab Agency: Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing", and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2, "Air Balancing."

2. Review, edit, and deliver annotated Contractors Systems Readiness Reports to Contractor, Engineer, and Commissioning Agent, with itemized TAB Agency concurrence or commentary, itemizing deficiencies discovered and confirming all systems preparation and examination has been properly performed, with initialed dated verification of each item by authorized responsible party.

3. Provide all testing and Balancing as required by the specific procedures outlined below and as required to provide the final test report as described below.

4. Mark equipment and balancing devices, valve position indicators, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

5. Take and report testing and balancing measurements in inch-pound (IP) units unless otherwise directed.

6. Promptly report abnormal conditions in mechanical systems or conditions that prevent system balance, for any reason including but not limited to installation, design, or Owner use reasons within 24 hours of discovery.

7. Report any defects or deficiencies observed during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values. Include updates in partial TAB report submittals. Adjust as-built drawings as required to accurately reflect deviations from draft as-built set.

3.4 GENERAL PROCEDURES: AIR SYSTEMS TESTING, ADJUSTING, AND BALANCING

A. Visit Site prior to concealment of construction to check and advise regarding location of dampers, test connections, etc. TAB Agency shall advise Contractor and Architect of TAB Agency findings by letter.

B. Review sheet metal shop drawings and mark locations of all required balancing dampers before duct fabrication.

C. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct in such a manner that local flow dynamics have a negligible effect on the measurements. Use multiple, bidirectional, traverses if flow measurements cannot be made in a section with at least 8 diameters straight duct upstream and 4 diameters of straight duct downstream from the measuring station. Mark all traverse locations on plans in report.

D. After adjustments, take measurements to verify balance has not been disrupted. Verify that disruptions in balance have been corrected.

E. Permanently mark valve, damper, and other adjustment device settings at devices to simplify restoration of settings. Record settings and include in report. Set and lock memory stops.

F. Procedures:

1. Verify that all systems are complete and operable as scheduled.

2. Verify that registers, grilles, and diffusers are adjusted to obtain uniform space temperatures and air movement free from objectionable drafts and noise. Cooperate with Owner and Contractor and reach agreement on air distribution pattern before proceeding.

3. Provide temporary filter media as follows: with the system fully operational, all dampers open, and the fan running at the scheduled RPM, check submittal values for new, midlife, and final/clogged filter pressure drops, check and record air pressure drop across the new clean final design filters, and provide temporary media to approximate midlife pressure drop across the filters for use during balancing. Record and report both pressure drop values at the final design flowrates. Adjust filter differential pressure switches to trip at correct final/clogged filter pressure drop in cooperation with Energy Management and Control System manufacturer's representative.

4. With the system fully operational, all dampers open, and the fan running at the approved submittal RPM, measure the airflow through all terminal units as well as the total system volume, without making any adjustments, and formulate a plan for preliminary adjustments of dampers and fan speed. Terminal units shall be defined to include all diffusers, registers, grilles, duct entries, louvers, hoods, etc.; i.e., wherever air enters or leaves ductwork whether indoors or outdoors. Record and report all initial values.

5. In cooperation with Energy Management and Control System manufacturer's representative, make mechanical adjustments of automatically operated dampers to operate as specified, indicated, and/or noted. Adjust and set the extreme operating conditions of these dampers and check completed damper control operations for proper calibration, reporting to control installers conflicts with those requiring adjustment. Test leakage of closed dampers. Adjust and set intermediate positions of outside air and return air dampers as required to achieve design outside airflow requirements defined in the sequence of operations, and / or calibrate outside air flow meters at this point. Balance variable volume systems at maximum air flow rate with full cooling and at minimum air flow rate with full heating

6. Adjust terminal units to the proportionally correct cfm, not necessarily the design cfm.

    a. If all the dampers in a branch line’s terminal units must be adjusted to limit cfm, then use the branch line volume damper to limit the pressure drop across the terminal units in that branch so that at least one terminal unit’s damper remains wide open but still has the correct flow. Adjust all branch ducts to proper proportional cfm in this way, leaving the volume dampers in the flow limiting branches wide open.

    b. Provide branch duct volume control by duct internal devices such as dampers and splitters only to the extent that the most open damper or splitter remains wide open and adjustments do not create objectionable air motion or sound levels. Under no circumstances shall total air system volume be throttled back to design flow through the partial closing of all dampers and splitters.

c. Record and report all initial adjustment positions and proportional flowrates achieved.

7. Vary total air system flowrate by adjustment of fan speeds. Provide drive changes required.

   a. For variable frequency drive fans, perform the following procedure:

   b. With the VSD set to bypass mode or set at 60 Hz, adjust the fan belt drive system (if applicable) as described above to achieve the design system cfm, with bypass dampers etc. closed or otherwise in the maximum resistance position.

   c. Adjust the VSD to the maximum non- overloading frequency for the system, and measure and report the flowrate at this frequency

   d. If other specific air flow rates are required due to the sequence of operations as reported on the drawings or in Section 23 09 00 “Instrumentation and Control for HVAC”, coordinate with these requirements and determine the required frequency -flow relationships

8. Verify that all terminal units are at the design cfm to within the balancing tolerance, and if not, repeat steps f. and g. above until design conditions are satisfied.

9. Test and record final motor, drive, air moving equipment, exhaust fan, damper, and terminal unit information at this point.

10. After all air flow rates are tested, adjusted, and balanced, test the performance of all air to air energy recovery equipment. Test the performance of air to air energy recovery equipment only when the outside air and inside air temperatures are close enough to summer or winter design conditions to verify performance. Test under either summer or winter conditions; if design conditions cannot be met during initial TAB work due to timing, provide energy recovery core testing under true design conditions at the six month system check. Include all data as specified above in reports.

11. Test and record air heating and cooling coil information after this point, as follows:

    a. Perform this step in conjunction with hydronic system balancing and after cooling and heating systems are operational.

    b. Set hydronic control valve to fully open at design flow and temperature as described below. Allow cooling coils to become fully wet with condensation. Test temperatures outside of the line of sight to the coil.

    c. Test and adjust coil performance for all data indicated to be on report test sheets.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.

    b. Measure static pressure directly at the fan outlet or through the flexible connection.

    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans to achieve indicated air-handling-unit performance.

7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.

3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance variable-air-volume systems the same as described for constant-volume air systems.

2. Set terminal units and supply fan at full-airflow condition.

3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.

4. Readjust fan airflow for final maximum readings.

5. Measure operating static pressure at the sensor that controls the supply fan if one is installed, and verify operation of the static-pressure controller.

6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.

7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check flow-control valves for specified sequence of operation, and set at indicated flow.
3. Set system controls so automatic valves are wide open.
4. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.

B. With the system fully operational, all branch and terminal isolation, balancing, and control valves open, and the pump running at 60Hz/VSD bypass, measure the flow through all terminal units as well as the total system volume, without making any adjustments, and formulate a plan for preliminary balancing valve adjustment. Record and report all initial flow and pressure drop values.

C. Adjust all manual balancing valves to the proportionally correct gpm, not necessarily the design gpm.

1. If all the valves in a branch line's terminal units must be adjusted to limit gpm, then use the branch line manual balancing or isolation valve to limit the pressure drop across the terminal units in that branch so that at least one terminal unit's balancing valve remains wide open but still has the correct flow. Adjust all other branch lines to proper proportional gpm in this way, leaving the balancing valves in the flow limiting branches wide open.

2. Provide branch volume control by balancing valves only to the extent that the most open valve remains wide open and adjustments do not create objectionable hydronic sound levels. Under no circumstances shall total system volume be throttled back to design flow through the partial closing of all branch valves.

3. Record and report all initial adjustment positions and proportional flowrates achieved.

3.9 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the automatic and manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.10 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.
B. Measure entering- and leaving-air temperatures.
C. Record compressor data.
D. Measure and record entering and leaving refrigerant pressures.

3.11 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.12 PROCEDURES FOR EXHAUST HOODS

A. Room Pressure: Measure and record room pressure with respect to atmosphere and adjacent space with hoods in room initially not operating and then with hoods operating.

B. Makeup Air: Insure systems supplying source of makeup air to hoods are in operation during testing and balancing of exhaust hoods.

1. Measure and record temperature of makeup air entering hood. If hood makeup air is from multiple sources having different temperatures, measure and record the airflow and temperatures of each source and calculate the weighted average temperature.

2. Use simulated smoke to observe supply air-distribution air patterns in vicinity of hoods. Consult with hood manufacturer and report conditions that have a detrimental effect on intended capture, containment, and other attributes effecting proper operation.

C. Kitchen Hoods:

1. Type 1: Measure and record pressure drop and face velocity of hood filters and slots in accordance with hood manufacturer's instructions. Consult hood manufacturer to determine hood airflow using recorded information.

2. Type 2: Measure and record airflow by duct traverse.

3. Capture and Containment: Check each hood for proper capture and containment using a smoke-emitting device. Utilize actual cooking or dishwashing equipment where possible. Observe and report performance. Make adjustments to achieve optimum results.

4. Modulating Hood Controllers: Check each hood for proper automatic starting and capture under varying cooking load and smoke generated conditions up to full design cooking load.

3.13 PROCEDURES FOR SPACE AIR PRESSURIZATION BY MECHANICAL SYSTEMS

A. Before testing and adjusting space pressurization systems, observe each pressurized space to verify construction is complete, including HVAC system, general construction including any firestopping, doors, weatherstripping, etc.. Verify the following:

1. Walls and ceiling are free of unintended openings and are capable of achieving a pressure boundary.
2. Firestopping and sealants are installed.
3. Doors, door closers, and door gaskets are installed and adjusted.
4. If applicable, window installation is complete.
5. HVAC system and associated controls are installed and functioning properly.
6. Life-safety dampers (smoke or combination fire and smoke) are installed and functioning properly.

B. Measure and record barometric pressure, wind speed and direction, outdoor-air temperature, and relative humidity on each test day. Proceed with testing and adjusting only on days with none to average wind speed.

C. Test each enclosure as a single system. If multiple fans serve a single enclosure, operate fans as intended by the design. In rooms with multiple or manual exhaust systems, test under each exhaust fan operating condition.

D. If a pressurization cascade is required between multiple spaces, for example an egress corridor, a science classroom, and an adjacent chemical storage room, plan and test sequentially as required achieving the required differential between each space.

E. Initial Air Balance:

1. Balance as specified achieving the airflow rates indicated by the design, and measure, adjust, and record the airflow of each outlet and inlet.

F. Pressurization Adjustment

1. Measure the space pressurization differential between the subject space and the adjacent space(s) across each door from the subject space to the adjacent spaces.

2. Adjust the exhaust and supply dampers as required achieving the specified pressure differential.

3. Do not reduce ventilation supply air rates to achieve space pressurization.

   a. For spaces required to be negative with respect to adjacent space, preferentially increase exhaust airflow.
   b. For spaces required to be positive with respect to adjacent space, preferentially decrease exhaust airflow.

4. If differential pressure is not indicated on the drawings, adjust as required to achieve a differential pressure between 0.03 and 0.05 inches water gauge with all doors shut and after equilibrium is reached.

5. If the space has no supply air similar to a small custodial closet, adjust the exhaust airflow as specified and measure and report the differential pressure achieved with the door closed.

6. Re-measure and report on the revised airflow rates required to achieve the space differential pressure.

7. Use a spring scale to measure and record the force needed to open all enclosure doors.

8. Repeat this procedure with all different operating configurations of the various automatic and manually operated exhaust systems.

9. Confirm the controls systems function to adjust the associated flowrates as required to maintain the specified differential pressure.

10. If standby power is provided for pressurization systems, test to verify pressurization systems operate while on both normal and standby power.

3.14 PROCEDURE FOR MISCELLANEOUS DEVICE TESTING

A. Test and adjust all devices on project as required to correctly report the data listed below under paragraph on final report.

3.15 TOLERANCES

A. Adjust system totals to the sum of the connected load (plus leakage for air systems) rather than the scheduled pump or fan capacity.

B. Adjust air handling systems as follows:

1. Main ducts (i.e., each fan system) to within minus 5 percent and plus 10 percent of the design values.
2. Outside air flow tolerance shall be at minimum that scheduled, with a tolerance of minus 0 percent and plus 10 percent.
3. Branch ducts and terminal units to within plus or minus10 percent of the design flow.
4. A total maximum variation of 10 percent between terminal units designated as “typical of (#)”.

C. Adjust hydronic systems as follows:

1. Branch lines and radiation to within 10 percent of the design flow values
2. A total maximum variation of 10 percent between terminal units designated as “typical of (#)”

3.16 PRELIMINARY REPORTING

A. Contract Document Examination Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for proper systems' balancing. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.17 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.

2. Name and address of the TAB contractor.

3. Project name.

4. Project location.

5. Architect's name and address.

6. Engineer's name and address.

7. Contractor's name and address.

8. Report date.

9. Signature of TAB supervisor who certifies the report.

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.

13. Data for terminal units, including manufacturer's name, type, size, and fittings.

14. Notes to explain why certain final data in the body of reports vary from indicated values.

15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Settings for supply-air, static-pressure controller.
    e. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Position of balancing devices.

E. Air Moving Equipment (ERU, F, MUA, CUH):

1. Location

2. Manufacturer

3. Model

4. Air flow, specified and actual

5. Return air flow, specified and actual

6. Outside air flow, specified and actual

7. Total static pressure (total external), specified and actual

8. Labeled diagram or annotated photograph showing pressure drop across each internal component including dampers, filters, coils, diffusers, and blowers. Provide multiple readings for complex systems with multiple internal dampers affecting system pressure drops, under all specified modes of operation. Include filter pressure drop under clean and partially loaded condition as specified.

9. Inlet pressure

10. Discharge pressure

11. Applicable data as specified elsewhere including coil, motor, damper, and drive data.

12. Fan RPM (for VSD driven fans, under various design conditions including at least full heating, 100% OA economizer, and full cooling loads)

13. Sound Test Data

F. Exhaust Fan Data (F):

1. Location
2. Manufacturer
3. Model
4. Air flow, specified and actual
5. Total static pressure (total external), specified and actual
6. Inlet pressure

7. Discharge pressure
8. Fan motor and drive data
9. Fan RPM(for VSD driven fans, under various design conditions including at least full heating, 100% OA economizer, and full cooling loads).
10. Sound Test Data

G. Apparatus-Coil Test Reports:

1. Coil Data:

   a. System identification.
   b. Location.
   c. Coil type.
   d. Number of rows.
   e. Fin spacing in fins per inch o.c.
   f. Make and model number.
   g. Face area in sq. ft.
   h. Tube size in NPS.
   i. Tube and fin materials.
   j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

   a. Air flow rate in cfm.
   b. Average face velocity in fpm.
   c. Air pressure drop in inches wg.
   d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
   e. Return-air, wet- and dry-bulb temperatures in deg F.
   f. Entering-air, wet- and dry-bulb temperatures in deg F .
   g. Leaving-air, wet- and dry-bulb temperatures in deg F.
   h. Water flow rate in gpm.
   i. Water pressure differential in feet of head or psig.
   j. Entering-water temperature in deg F.
   k. Leaving-water temperature in deg F.
   l. Refrigerant expansion valve and refrigerant types.
   m. Refrigerant suction pressure in psig.
   n. Refrigerant suction temperature in deg F.

H. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

   a. System and air-handling-unit identification.
   b. Location and zone.
   c. Room or riser served.
   d. Coil make and size.
   e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Entering-water temperature in deg F.
    c. Leaving-water temperature in deg F.
    d. Water pressure drop in feet of head or psig.
    e. Entering-air temperature in deg F.
    f. Leaving-air temperature in deg F.

I. Gas-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Fuel type in input data.
    g. Output capacity in Btu/h.
    h. Ignition type.
    i. Burner-control types.
    j. Motor horsepower and rpm.
    k. Motor volts, phase, and hertz.
    l. Motor full-load amperage and service factor.

2. Test Data (Indicated and Actual Values):

    a. Total air flow rate in cfm.
    b. Entering-air temperature in deg F.
    c. Leaving-air temperature in deg F.
    d. Air temperature differential in deg F.
    e. Entering-air static pressure in inches wg .
    f. Leaving-air static pressure in inches wg.
    g. Air static-pressure differential in inches wg.
    h. Low-fire fuel input in Btu/h.
    i. High-fire fuel input in Btu/h.
    j. Manifold pressure in psig.
    k. High-temperature-limit setting in deg F.
    l. Operating set point in Btu/h.
    m. Motor voltage at each connection.
    n. Motor amperage for each phase.
    o. Heating value of fuel in Btu/h.
    p. Sound Test Data.

J. Round, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

    a. System and air-handling-unit number.
    b. Location and zone.
    c. Traverse air temperature in deg F.
    d. Duct static pressure in inches wg .
    e. Duct size in inches.
    f. Duct area in sq. ft..
    g. Indicated air flow rate in cfm.
    h. Indicated velocity in fpm.
    i. Actual air flow rate in cfm.
    j. Actual average velocity in fpm.
    k. Barometric pressure in psig.

K. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.
    c. Apparatus used for test.
    d. Area served.
    e. Make.
    f. Number from system diagram.
    g. Type and model number.
    h. Size.
    i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Air velocity in fpm.
    c. Preliminary air flow rate as needed in cfm.
    d. Preliminary velocity as needed in fpm.
    e. Final air flow rate in cfm .
    f. Final velocity in fpm.
    g. Space temperature in deg F.
    h. Sound Test Data.

L. Electric Motors:

1. Manufacturer
2. HP/BHP
3. Phase, voltage, amperage (nameplate, actual, and no load)
4. RPM
5. Service factor
6. Starter size, rating, heater elements

M. Automatic Air Dampers (AAD, TBAAD, or internal to air moving equipment):

1. Location

2. Manufacturer

3. Model

4. Airflow, specified and actual.

5. Check closed position leakage and report.

6. Damper and/or actuator position at all required positions, along with associated controls signal required to achieve position. Coordinate required positions of return air and outside air ventilation control dampers with positions required by required ventilation rates. Refer to Section 23 09 00 "Instrumentation and Controls for HVAC", and coordinate damper position adjustment with temperature controls and Owner's required occupancy schedule.

7. Total static pressure drop at all required positions.

N. Manual Air Volume Dampers (VD, or shown with no text as: ⊺):

1. Location.
2. Report final damper position as angular deviation of blades from axial, with 0° being fully open and 90° being closed. Mark this position on duct at damper also.
3. Total static pressure drop across damper in as balanced condition.

O. Air Distribution Test Sheet (registers, grilles, and diffusers):

1. Air terminal number
2. Room number/location
3. Space Temperature
4. Terminal type
5. Terminal size
6. Area factor
7. Design velocity
8. Design air flow
9. Test (initial, adjusted, and final) velocities
10. Test (initial, adjusted, and final) air flows
11. Percent of design air flow
12. Sound Test Data.

P. Roof Top Hoods, Louvers, Duct Entries:

1. Air terminal number / drawing designation
2. Room number/location
3. Terminal type
4. Terminal size
5. Free Area
6. Design velocity

7. Test (final) velocity
8. Design air flow
9. Test (final) air flow
10. Percent of design air flow
11. Design Pressure drop
12. Test (final) pressure drop

Q. Automatic Balancing Valves Reports:

1. Identification/station
2. Location
3. Size
4. Manufacturer
5. Model
6. Design flow rate
7. Functional pressure drop range.
8. Actual/final pressure drop at system full flow condition.

R. Hydronic Control Valves Reports:

1. Location
2. Manufacturer
3. Model
4. Flowrate, specified and actual.
5. Pressure drop at full flow condition.

S. Gauges and Thermometers Reports:

1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Test all gauges and thermometers for mid range accuracy. Adjust thermometers where applicable; adjust all gauges for best 0 and/or midrange accuracy.
6. Temperature, test reading and actual
7. Pressure, test reading and actual

T. Controls Sensors Reports:

1. Coordinate work with Energy Management and Control System.

2. Test all controls system temperature, pressure, air monitoring (CO_2, CO, combustible gasses, humidity, etc.), and electrical current analog sensors for mid normal operating range accuracy. Adjust where applicable.

3. Test all controls system temperature, pressure, air monitoring (CO_2, CO, combustible gasses, humidity, etc.), and electrical current digital (on/off) sensors/switches for trip point. Adjust where applicable.

4. Verify that locations shown on Operators Work Station are schematically correct.

5. Identification/number

6. Location

7. Service

8. Manufacturer

9. Temperature, test reading and actual

10. Pressure, test reading and actual

11. **A**ir composition, parts per million, test reading and actual. Test and adjust at normal ambient and alarm conditions.

U. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.18 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

2. Check the following for each system:

a. Measure water flow of each device.
b. Verify that balancing devices are marked with final balance position.
c. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection by TAB Agency is complete and documentation verifies that testing and balancing are complete and accurately documented in the report, request that a final inspection be made, giving at minimum 7 calendar days' notice. Deliver copies of Draft Final Report to Engineer and Commissioning Authority with final inspection request.

a. Engineer may elect to postpone final inspection upon delivery of written notice to TAB Agency that significant portions of the required TAB results are missing from draft report. If inspection is postponed, TAB Agency shall promptly return to site and provide missing TAB Work, then submit a revised draft and request the Final Inspection again.

2. The TAB Agency and Contractor's qualified technicians are to provide access, tools, and measurements during the inspection in the presence of the TAB Agency Supervisor and the Commissioning Authority.

3. Commissioning Authority will randomly select measurements, documented in the report or as required by contract, to be rechecked. Rechecking will be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED." If recheck calls for a measurement that is required but cannot be found in the draft report, the missing measurement will be noted as "MISSING".

5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the TAB Work will be considered defective and rejected. If the number of "MISSING" measurements is greater than 10 percent of the total measurements checked during the final inspection, the TAB Work will be considered defective and rejected.

C. If TAB Work is considered defective and rejected, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. Pay all costs associated with second inspection including Commissioning Authority's reasonable additional fees.

2. If the second final inspection also fails, Owner may require additional inspection similar to second inspection or may contract the services of another TAB agency to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB Agency's final payment.

D. Prepare test and inspection reports.

3.19 ADDITIONAL TESTS

A. Re-check and adjust systems approximately 6 months after final acceptance and submit report:

1. Measure the total flow rate of each of the systems originally covered by this section.

2. For each of the systems that no longer operate at design flow measure the flow at each of the terminals of that system.

3. Measure the flow at any terminals included in the original balancing, reported by the Owner or Architect to have continued or new problems.

4. Adjust system changes back to the design values if possible, and submit reports in writing to the Architect, Contractor, and Owner, noting any changes and/or complaints, and offering an interpretation of the cause and significance of the problems.

5. If the design air temperature criteria as specified cannot be satisfied upon initial balancing, perform this six month stability check at a time when it can be, and repeat water system balancing and chiller / heat exchanger performance testing using air temperature at the design conditions.

END OF SECTION 23 05 93

SECTION 23 07 00 – HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and all Division 01 Sections, apply to this Section.

1.2 SUMMARY

A. Section includes materials and installation requirements for mechanical component insulation and related accessories.

1. Insulation Materials:

a. Calcium silicate.
b. Cellular glass.
c. Flexible elastomeric.
d. Mineral fiber.
e. Phenolic.
f. Polyisocyanurate.
g. Polyolefin.
h. Polystyrene.

2. Insulation Accessories:

a. Insulating cements.
b. Adhesives.
c. Mastics.
d. Lagging adhesives.
e. Sealants.
f. Factory-applied jackets.
g. Field-applied fabric-reinforcing mesh.
h. Field-applied jackets.
i. Tapes.
j. Securements.
k. Insulation protection systems

1.3 DEFINITIONS

A. “Concealed”: Work within or behind various construction elements, or in crawl spaces or trenches, that is not exposed to view when Project has been completed. (Areas above ceilings, including above Auditorium or Large Group Instruction partially open “cloud” ceilings and chases are considered a concealed location.)

B. “Exposed”: Anything exposed to view when project has been completed.

1.4 SUBMITTALS

A. Comply with requirements of Section 01 33 00 “Submittal Procedures” and as modified below.

B. Provide all submittals required by this Section concurrently.

C. Product Data

1. Submit complete manufacturer’s product information for each type of insulation and accessory specified in this section demonstrating compliance with specified requirements and including:

   a. Thermal and vapor transmission performance.
   b. MSDS information.
   c. Flame spread / smoke developed data.
   d. Manufacturer’s recommended installation methods.

D. Submit insulation schedule indicating each required service with type of insulation, thickness and R value, covering method, finishes, and any applicable notes.

E. Quality Control Submittals

1. Qualifications Certification: Submit written certification of installers signed by applicable certification agency and/or manufacturer (where applicable) indicating compliance with “Installer Qualifications” requirements specified below in “Quality Assurance” article.

2. Installer Experience Listing: Submit list of completed projects using products proposed for this Project, including Owner contact information for each project, demonstrating compliance with applicable “Qualifications” requirements specified below in “Quality Assurance” article.

F. Contract Closeout Submittals: Comply with requirements of Division 1 sections on closeout, including submission of maintenance instructions as item in "Operating and Maintenance Data" manual described there.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Provide insulation system installation by qualified Installers who are trained in installation of each proposed insulation material and product with at least one of the following qualifications:

1. Have successfully completed a mechanical insulation apprenticeship program by the Department of Labor, Bureau of Apprenticeship and Training,
2. Have successfully completed an ASHRAE / NIA 8 hour Mechanical Insulation Training course or equal, or
3. Have five years documented experience as a mechanical insulation specialist with references attesting to successful completion of at least three comparable projects.

B. Condensation Resistance: Provide insulation and vapor barrier systems complete as required to eliminate condensation under any normal operating conditions from surfaces of all cooling equipment and components provided or modified as a part of this contract Work, unless those surfaces are designed to remove moisture by condensation from process air, and to contain and drain the condensate.

C. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Components."

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 with 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.

1.8 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For convenience, details and specifications have been based on products by the following manufacturers:

1. Armstrong; Lancaster, Pennsylvania
2. Benjamin Foster
3. CertainTeed; Valley Forge, Pennsylvania
4. Fit Tight Covers, Inc.
5. Johns Manville; Defiance, Ohio
6. Kingspan Tarec
7. Knauf; North Carolina
8. No Sweat Valve Wraps, Inc.
9. Owens-Corning; Toledo, Ohio
10. Polyguard Products Inc., Ennis, Texas
11. Thermaxx, LLC.
12. Or Approved Equal.

2.2 MATERIALS

A. Pipe and Fitting Insulation: Provide pipe insulation in compliance with ASTM C 585 Dimensional Standards.

1. Insulation Thickness:

a. Pipe and fitting insulation thicknesses specified assume an insulation conductivity (k) value of 0.27 btu•in/hr•ft2•°F. For pipe and fitting insulation with conductivity other than 0.27 btu•in/hr•ft2•°F, insulation must be thicker for higher conductivity and may be thinner for lower conductivity as required to achieve same or higher R value. Adjust insulation thickness from that specified in accordance with the following formula:

T = r[(1+t/r)K/k-1] where:

1) T = Adjusted insulation thickness, inches
2) r = Actual pipe outside radius, inches.
3) t = Insulation thickness specified, inches.
4) K = actual insulation conductivity, btu•in/hr•ft2•°F.
5) k = specified conductivity, 0.27 btu•in/hr•ft2•°F.

b. Hydronic Piping for Heating:

1) Pipe sizes ½ inch through 1-¼ inches ..... 1-1/2 inch
2) Pipe sizes 1-½ inches and larger ..... 2 inches

c. Condensate Drain Piping

1) All pipe sizes..... ½ inch

d. Refrigerant Suction Piping:

1) All pipe sizes..... 1 inch

e. All Variable Refrigerant Flow and Heat Pump Refrigerant Piping:

1) All pipe sizes..... 1 inch

2. Interior Above Grade Hydronic Piping Insulation:

a. ASTM C547, cylindrically molded preformed rigid half pipe shell forms, factory one-piece "hinged" construction.

1) Rigid pipe or tube insulation may be of mineral wool, fiberglass, closed cell glass, formed polyisocyanurate, formed phenolic, or extruded polystyrene (chilled service only).

2) Thermal Conductivity ("k"): Measured in accordance with ASTM C 335. For k values greater than 0.27, include calculations and compliant increased thickness proposed. For k values equal or less than 0.27, provide specified insulation thickness or calculations justifying thinner insulation.

3) Jacket: All Purpose (AP) vapor barrier jacket with:

a) White kraft paper outer surface bonded to aluminum foil, reinforced with fiberglass yarn, permanently treated for fire and smoke safety and to prevent corrosion of foil.

b) Self sealing pressure sensitive lap.

c) Water Vapor Permeance: ASTM E96, Procedure A, 0.02 perm maximum.

d) Puncture resistance: ASTM D781, 85 scale units minimum

e) Burst resistance: ASTM D774, 100psi minimum.

f) Similar to "150TL facing" as used in "AP T Plus Jacket" and tape by Johns Manville, or equal.

3. Refrigerant Piping, Flexible Connections Insulation: fire-resistant, closed cell flexible (elastomeric) foam plastic, similar to Armacell Armaflex with manufacturer's white painted mastic protective finish.

4. Condensate Drain Lines: insulation material similar to rigid pipe or refrigerant piping insulation specified above.

5. Fitting and Valve Insulation: Precut fiberglass blanket to match thickness, appearance and insulation value of adjacent pipe insulation; similar to "Hi Lo Temp Fiber Glass Insulation Insert" by Johns Manville, with fitted protective jacket specified for the installation.

B. Pipe and Fitting Protective Jackets:

1. Intended for permanent installation on non-serviceable components only.

2. Interior Pipe and Fitting Insulation Protective Jacket:

a. Plastic: High-impact, UV resistant polyvinyl chloride, white, paintable, covering designed to fit over AP jacketed insulated piping systems, molded to fit various sizes of fittings and piping as required; similar to "Zeston 2000 or Zeston 300 PVC Jacketing" by Johns Manville.

1) 20 mil thickness: Fittings and valves in interior applications eight feet above finished floor and higher.
2) 30 mil thickness: Fittings, valves, and straight pipe in interior applications lower than eight feet above finished floor.

3. Exterior Pipe and Fitting Insulation Protective Jacket: Modified bituminous, aluminum skinned, peal and stick membrane, similar to Polyguard "Alumaguard 60", with the following properties:

a. Minimum 60 mils thick
b. Permeance less than 0.01 Perms
c. Puncture resistance per ASTM E154 >40lbs.
d. Overlap bond peal adhesion per ASTM D1000 never less than 11lb/in.
e. UV stabilized.
f. Self healing when punctured.

C. Valve Covers, Serviceable Hydronic Component Insulation Jackets:

1. 2" nominal size and smaller Strainers, Triple Duty, Autoflow Control, Check, Combination, and Control Valves, and other similar piping components needing periodic service, maintenance or adjustment - provide easily removable insulation jacket requiring no special tools for installation or removal / replacement:

a. Factory fabricated removable and reusable cover similar to products by No Sweat Valve Wraps, Inc., or approved equal.

b. Size so outer jacket overlaps adjoining sections of pipe insulation.

c. Flame and smoke spread 25/50 per ASTM E-84 or less.

d. Maximum k- factor .26 or matching surrounding insulation, using fiberglass blanket.

e. Outer jacket made of material equal to DuPont Tychem® QC (polyethylene coated Tyvek), overlapping and completely covering the insulation with seams joined by integral elastic banding and tabs made from hook and loop fasteners (Velcro).

f. Butt ends and stem penetrations have sewn-in-place elastic. On cooling service, provide PSA backed closed cell foam gasket material adhered to stem penetration or surrounding insulation jacket between substrate and elastic jacket closure, as required insuring a complete vapor seal.

D. Duct Insulation

1. Provide insulation thickness on ducts, plenums, and equipment equal to height of flanges, but not less than thickness required to achieve duct insulation R values specified herein:

a. R=6 deg. F-sq. ft.-h/Btu-in:

1) All interior HVAC duct where insulation is required, unless otherwise noted elsewhere.

b. R=12 deg. F-sq. ft.-h/Btu-in

1) Interior outside air intake duct

c. R=12 deg. F-sq. ft.-h/Btu-in:

1) Exterior Duct with no transverse dimension above 48 inches (R=10 minimum, not average)

2. Rigid Board: 3 PCF minimum density glass fiber board (6PCF when exposed in mechanical or utility spaces) or phenolic, with factory-applied AP vapor barrier; similar to “800 series Spin-Glas” and “AP” facing by Johns Manville, or Kingspan KoolDuct.

3. Semi-Flexible: 2.5 PCF minimum density continuous glass fiber oriented strand sheets, with factory-applied AP vapor barrier. Strand orientation such that material has comparable rigidity to board type insulation above in one direction and comparable compressive strength, but is flexible enough in the other direction to wrap curved surfaces at a factory recommended minimum bend radius of 3T where T is the material thickness. Similar to “CrimpWrap” by CertainTeed.

4. Flexible: Glass fiber blanket, 3/4 PCF minimum density, with factory-applied, flame-resistant, FSK jacket; all joints taped; similar to Owens Corning “Fiberglas All Service Duct Wrap”.

E. Ductwork Insulation Protective Jackets:

1. All Purpose (AP) Vapor Barrier for Duct Insulation: White kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn, permanently treated for fire and smoke safety and to prevent corrosion of foil.

a. Water Vapor Permeance: ASTM E96, Procedure A, 0.02 perm maximum.
b. Puncture resistance: ASTM D781, 85 scale units minimum.

c. Burst resistance: ASTM D774, 100psi minimum.
d. Similar to "150TL facing" as used in "AP T Plus Jacket" and tape by Johns Manville, or equal.

2. Foil-Skrim-Kraft (FSK) Vapor Barrier for Duct Insulation: Foil faced outer surface bonded to kraft paper backing and reinforced with fiberglass yarn, permanently treated for fire and smoke safety and to prevent corrosion of foil.

a. Water Vapor Permeance: ASTM E96, Procedure A, 0.02 perm maximum.
b. Similar to "FSK Jacket" and tape by Johns Manville, or equal.

3. Exterior Duct Insulation Covering:

a. Modified bituminous, aluminum skinned, peal and stick membrane, similar to Polyguard "Alumaguard 60", with the following properties:

1) Minimum 60 mils thick
2) Permeance less than 0.01 Perms
3) Puncture resistance per ASTM E154 >40lbs.
4) Overlap bond peal adhesion per ASTM D1000 never less than 11lb/in.
5) UV stabilized.
6) Self healing when punctured.

F. Insulation Accessories:

1. Mechanical Pin Fasteners: Provide welded or adhered pins of length based on manufacturer's recommendations for insulation density and thickness, securely holding insulation with insulation manufacturer's recommended compression. Mechanical Pin Fastener types include:

a. Stud style welded pins minimum 12 gauge diameter with matching push-on washers. Welded on with capacitor discharge type pin welder with no burn through or undercutting. Welded on prior to insulation application allowing for inspection prior to insulating.

b. Cup head style welded minimum 12 gauge diameter with integral washers. Welded on with capacitor discharge type pin welder with no burn through or undercutting. Welded on after insulation application dis-allowing inspection of pin welds without insulation removal. Not permitted for any Class A or tighter duct, not permitted for any fire rated duct insulation application.

c. Adhered style with perforated metal back plate (minimum 4 square inches surface area) welded to 12 gauge pins with matching push washers, bonded with full coverage of manufacturer's recommended adhesive. Not permitted for any fire rated duct insulation application.

d. Not permitted: PSA backed "peal and stick" pins, sheet metal fastening screws, or any other penetration of duct by fasteners.

2. Insulation Tapes: Provide insulation manufacturers' recommended and matching tapes, matching characteristics of exterior jacket of insulation, in widths as required and as specified below to seal all gaps and reinforce vulnerable areas in vapor barrier. Provide tapes with peel off protective coating covering high performance acrylic adhesive unless manufacturer documents superior performance of alternative recommendation.

3. Insulation Adhesives and Mastics: Provide insulation manufacturers' recommended and matching adhesives and mastics, as required and as specified below to seal all gaps and reinforce vulnerable areas in vapor barrier. Provide with water based and low VOC formulations unless manufacturer documents superior performance of alternative recommendation and performance deficiencies of water based low VOC products.

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.
B. Verify that systems and equipment to be insulated have been tested and are free of defects.
C. Verify that surfaces to be insulated are clean and dry.
D. Proceed with installation only after unsatisfactory conditions have been corrected.
E. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

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 inhibition coating to surfaces to be insulated as follows:
C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 INSTALLATION

A. General:

1. Provide thermal and acoustical insulation for components shown on the Drawings as specified in this Section for the following:

a. All heating and air conditioning systems piping including fittings, valves, and accessories.

1) Include removal of existing insulation and replacement insulation as specified for existing piping where existing insulation is damaged as a result of contract work.

b. All heating and air conditioning ductwork unless noted otherwise.

1) All heating and air conditioning ductwork shall be insulated whether exposed or not.

c. All outside air ductwork extending from exterior wall or roof to the equipment which it serves.

d. Exhaust, return, and relief air ductwork not passing through air to air energy recovery devices prior to exiting the building: extending from exterior wall or roof 15 feet into the building envelope in all directions of duct branch take-offs.

e. All cooling condensate drain lines.

2. Comply with manufacturer's installation instructions and recommendations.

3. Do not begin mechanical insulation until permission is granted to begin mechanical insulation installation, hydronic systems have proved drip free under pressure, duct systems have passed required duct leakage requirements and testing, indoor work areas are weather tight, and outdoor work areas are at appropriate ambient conditions.

4. Do not use any insulation support system which causes compression of insulation, localized or widespread, to less than 75% of the rated nominal thickness. Wires wrapped around rectangular duct insulation are not permitted as insulation support.

5. Provide for durable and repeated service access as part of insulation system.

a. Do not permanently cover inspection stampings, hand holes, manholes, plugged outlets, or similar features on equipment – provide removable labeled insulated access port with beveled and sealed insulation plug, gasketed if vapor barrier is needed, durably fabricated for repeated access.

6. Install thermal mechanical insulation as follows:

a. Only on clean, dry surfaces and after piping and ductwork has been tested and found to be tight.
b. Continuously through wall or ceiling openings and sleeves.
c. On cold surfaces with continuous unbroken vapor seal.
d. Insulate ducts and pipes individually.

B. Pipe Insulation

1. Comply with manufacturer's installation instructions and recommendations. Install only when ambient temperatures are within range recommended by manufacturer. STAPLES NOT PERMITTED.

2. Provide high impact plastic wrapper on all exposed, insulated piping from finished floor to 8 ft. above finished floor.

3. Interior Pipe and Fitting Insulation: Install on all heating, and condensate piping. Seal with factory applied pressure-sealing adhesive strip on the longitudinal lap. Seal butt joints with pressure-sealing adhesive strip at least 2 inches wide. Install valve and fitting covers in all locations.

4. Refrigerant Piping Insulation: Install in full accordance with manufacturers specifications and recommendations on refrigerant and condensate lines, using adhesive specifically intended for flexible foam plastic and provided by insulation supplier. Paint all exposed insulation cut ends with manufacturers (white) finish, similar to "WB Armaflex" or equal. Provide preformed elbows and fittings where available and neatly mitered and fit custom fabrications where manufactured components are not available. Tape and seal all joints vapor tight. For exterior refrigerant piping, install exterior piping protective wrapper water and air tight in accordance with manufacturer's printed installation directions.

5. Insulation at Pipe Support: Refer to Section 23 05 29 "Hangers and Supports" for material specifications of insulated piping support assembly and pipe support insulation. Complete insulation installation for the applicable pipe support insulation type to be used.

    a. Type "B" Pipe Support Insulation:

        1) Install pipe support insulation at hanger and support locations in conformance with manufacturer's recommendations and as indicated on Drawings.

        2) Remove a section of insulation from pipe insulation and replace this section with heavy density molded fiberglass blocks without breaking vapor barrier wrap.

C. Ductwork Insulation: Provide external thermal insulation on ducts as specified or indicated on Drawings; external thermal insulation not required where ducts are shown or specified with internal acoustical insulation. Insulate and seal around duct dampers, damper motors, thermometers, instruments, access doors, and similar component as required without restricting operation or function. Insulate all ducts in all concealed spaces.

1. Use flexible type insulation on concealed ductwork with widths or diameters of 18 inches or less only. Insulate all other ductwork requiring insulation with rigid board type, semi-flexible type, or other type as required by drawings and specifications.

2. Duct Insulation Mechanical Fasteners: Provide mechanical fasteners for all duct surfaces over 12" wide. For duct surfaces 18"" wide and less, provide single row of fasteners down duct centerline. For duct surfaces over 18" wide, install minimum of 2 rows per side, applied on maximum 18" centers, starting within 3" of any edge.

    a. Pins with the point facing out accepting push washers: clip points close to washers and cover with vapor barrier adhesive and tape. Not permitted on mechanical room duct unless covered by puncture resistant protective wrapper.

3. Duct Insulation Tape: Apply only to clean dry dust free surfaces as recommended by tape manufacturer and as required for durable adhesion.

    a. Pealing tape, loose insulation, or otherwise broken vapor barrier subject to repeated recall.

4. Rigid Board Type Insulation Installation: Install board with all corners mitered or rabbeted; no butt joints allowed. Secure insulation with mechanical fasteners. Apply corner reinforcement angles (beads) on all corners for exposed ductwork (including in mechanical or storage spaces), with edge tape over beads. Seal all breaks and joints in vapor barrier with 3 to 5 inches wide insulation tape (minimum 1.5" tape past break all around).

5. Semi-flexible Type: Install similar to rigid board type, on round duct, curved elbows, etc.. Wrap curved and round surfaces taught, provide circumference tape band maximum two feet on center (butt joints and center of four foot roll stock).

6. Flexible Type Insulation Installation: Make all joints and seams with 2-inch lap of vapor barrier cemented with Benjamin Foster "BF85-20". Apply Benjamin Foster "BF-20" adhesive to ducts in 6-inch brush widths at 1 ft. intervals and at each facing edge. Tape all adhered with Benjamin Foster "BF-20". Tape seal all seams, breaks, and joints in vapor barrier, then continuously coat all tape with manufacturer's recommended vapor barrier adhesive.

7. Exterior Duct Work Insulation: Install insulation and covering in strict compliance with manufacturer's printed instructions and recommendations and as follows:

    a. Mechanically fasten insulation to duct.

    b. Slope top insulation a minimum ¼" per foot for positive drainage using tapered thickness panels, not shims with air gaps below.

    c. Tape joints and ruptures in facing, using adhesive tape of type recommended by insulation manufacturer, and seal each continuous area of insulation to surrounding construction ensuring vapor tight installation.

    d. Seal and protect exterior duct work insulation with Exterior Duct Insulation Covering, making all joints and terminations watertight with any and all special details as required by application.

    e. Mechanically support bottom of duct Exterior Duct Insulation Covering on all exterior duct 24 inches wide and wider such that there is no unsupported dimension over 30 inches. Provide transverse and if required longitudinal strut system compressing Exterior Duct Insulation Covering against bottom of duct. Refer to Section 23 05 29 – Hangers and Supports for HVAC Components, for details of corrosion resistance and construction of insulation support system.

f. Provide for air pressure bleed ports in the bottom of insulation system of exterior positive pressure duct as required to bleed off duct leakage without pressurizing insulation system. Typical bleed port shall be similar to ¼" OD nylon tubing penetrating bottom of insulation full thickness of insulation, extending ½ inch below insulation cover, cut off at 45 degrees both ends, and sealed to insulation and covering with appropriate caulk. On vertical duct, slope down for drainage. Provide one bleed port for every 10 linear feet of exterior duct.

1) Test and eliminate duct leakage before applying insulation system. If additional bleed ports are needed to prevent insulation covering from bulging out between supports due to internal pressure, remove insulation and reseal duct to control leakage.

END OF SECTION 23 07 00

SECTION 23 08 00 - COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1. See especially Section 01 08 00 "General Commissioning Requirements" for general commissioning process requirements and Commissioning Coordinator responsibilities.

1.2 SUMMARY

A. Section includes commissioning process requirements for the following Building Mechanical Systems, which are described in more detail in the technical specifications of Division 23.

1. Distribution systems, including supply and return air distribution (heating and cooling) systems, hot water distribution systems, exhaust systems air-handling units.
2. Terminal and packaged units, including, unit heaters, fan-coil units, finned-tube radiation and packaged units.
3. Vibration, sound, and movement control systems, including vibration isolation devices, sound attenuation, and seismic restraints.
4. Energy Management and Control System.
5. Systems testing, adjusting, and balancing verification, including all of the above mentioned systems.

1.3 DEFINITIONS

A. BAS: Building automation system, also known as Energy Management and Control System (EMCS).

B. Building Mechanical Systems: All Systems, Subsystems, Equipment, and Components of the building systems traditionally known as Heating, Ventilating, Air Conditioning, Refrigeration, Plumbing, and Electrical Works.

C. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

D. CxA: Commissioning Authority –The Owner or a third party commissioning agent designated by the Owner.

E. DDC: Direct digital controls, a part of the BAS.

F. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

G. "Systems," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

H. TAB: Testing, adjusting, and balancing.

1.4 SUBMITTALS

A. Qualification Data: For BAS and HVAC&R Testing Technician.

B. Construction Checklists: Provide construction pre-functional test checklists filled out by qualified technician for all equipment to be commissioned on this project, including but not limited to all :

1. Vibration, Sound, and Movement / Seismic controls for HVAC&R.
2. BAS.
3. Heating-water piping and accessories.
4. Refrigerant piping.
5. Metal ducts and accessories.
6. Fans.
7. Air-handling units.
8. Heat Pumps.

C. Certificates of readiness and completion of installation.

D. Test and inspection reports and certificates.

E. Corrective action documents.

F. Instrumentation Calibration Information

G. Functional Performance Test Procedures

1.5 QUALITY ASSURANCE

A. BAS Testing Technician Qualifications: Technicians to perform BAS construction checklist verification tests, construction checklist verification test demonstrations, commissioning tests, and commissioning test demonstrations shall have the following minimum qualifications:

1. Journey-level or equivalent skill level with knowledge of BAS, HVAC&R, electrical concepts, and building operations.
2. Minimum three years' experience installing, servicing, and operating systems manufactured by approved manufacturer.
3. International Society of Automation (ISA) Certified Control Systems Technician (CCST) Level I.

B. HVAC&R Testing Technician Qualifications: Technicians to perform HVAC&R construction checklist verification tests, construction checklist verification test demonstrations, commissioning tests, and commissioning test demonstrations shall have the following minimum qualifications:

1. Journey-level or equivalent skill level. Vocational School four-year program graduate or an Associates degree in mechanical systems, air conditioning, or similar field. Degree may be offset by three years' experience in servicing mechanical systems in the HVAC industry. Generally, required knowledge includes HVAC&R systems, electrical concepts, building operations, and application and use of tools and instrumentation to measure performance of HVAC&R equipment, assemblies, and systems.

2. Minimum three years' experience installing, servicing, and operating systems manufactured by approved manufacturer.

3. One of the following:

    a. National Environmental Balancing Bureau (NEBB) Certified Testing, Adjusting, and Balancing Technician.
    b. Associated Air Balance Council (AABC) Certified Test and Balance Technician.
    c. Owner retains the right to waive NEBB or AABC Certification.

C. Testing Equipment and Instrumentation Quality and Calibration: For test equipment and instrumentation required to perform HVAC&R commissioning work, perform the following:

1. Submit test equipment and instrumentation list. For each equipment or instrument, identify the following:

    a. Equipment/instrument identification number.
    b. Planned commissioning application or use.
    c. Manufacturer, make, model, and serial number.
    d. Calibration history, including certificates from agencies that calibrate the equipment and instrumentation.

2. Test equipment and instrumentation shall meet the following criteria:

    a. Capable of testing and measuring performance within the specified acceptance criteria.
    b. Be calibrated at the manufacturer's recommended intervals with current calibration tags permanently affixed to the instrument being used.
    c. Be maintained in good repair and operating condition throughout the duration of use on this Project.
    d. Be recalibrated/repaired if dropped or damaged in any way since last calibrated.

D. Proprietary Test Instrumentation and Tools:

1. Equipment Manufacturer's Proprietary Instrumentation and Tools: For installed equipment included in the commissioning process, test instrumentation and tools manufactured or prescribed by equipment manufacturer to service, calibrate, adjust, repair, or otherwise work on its equipment or required as a condition of equipment warranty, perform the following:

a. Submit proprietary instrumentation and tools list. For each instrument or tool, identify the following:

1) Instrument or tool identification number.
2) Equipment schedule designation of equipment for which the instrument or tool is required.
3) Manufacturer, make, model, and serial number.
4) Calibration history, including certificates from agencies that calibrate the instrument or tool, where appropriate.

b. Include a separate list of proprietary test instrumentation and tools in the operation and maintenance manuals.

c. HVAC&R proprietary test instrumentation and tools become the property of Owner at the time of Substantial Completion.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Provide mechanical work in accordance with contract document requirements.

B. Perform commissioning tests including Materials Checks, Installation Checks, Start-up Checks, Startups, and Functional Testing, all at the direction of the CxA.

C. Attend construction phase controls coordination meetings.

D. Attend and participate in TAB review and coordination meetings

E. Attend and participate in commissioning meetings.

F. Participate in Building Mechanical Systems maintenance orientation and inspection as directed by the CxA.

G. Prepare Construction / Prefunctional Checklists and Functional Performance Test procedures and execute and document results. All Prefunctional Checklists and tests must be documented using specific, procedural forms in Microsoft Word or Excel software developed for that purpose. Prior to testing, Contractor shall submit those forms for review and approval.

H. Submit documentation required for Commissioning work. At minimum, include: Detailed Start-up procedures, Full sequences of operation, Operating and Maintenance data, Performance data, checkout sheet forms used by factory or manufacturer’s field technicians, Functional Performance Test Procedures, Control Drawings, and details of Owner-Contracted tests.

I. Review and approve other relative documentation for impact on Functional Performance Tests of the systems:

1. Shop Drawings and product submittal data related to systems or equipment to be commissioned. Review and incorporate comments from the CxA.

2. Incorporate manufacturer's Start-up procedures with Prefunctional checklists.

3. Factory Performance Test Reports: Review and compile all factory performance data to assure that the data is complete prior to executing the Functional Performance Testing.

4. Complete equipment Construction / Prefunctional Checklists, Start-up certification forms, and the manufacturer's field or factory performance and Start-up test documentation: review the documentation prior to commencing with the scheduled Functional Performance Tests.

5. Final Testing Reports: Contractor or Subcontractor performing the test will review the documentation prior to commencing with the scheduled Functional Performance Tests.

6. Operating and Maintenance (O&M) information per requirements of the Technical Specifications and Division 01 requirements: To validate adequacy and completeness of the Functional Performance Tests, the Contractor shall ensure that the O&M manual content, marked-up record Drawings and Specifications, component submittal drawings, and other pertinent documents are available at the Project Site for review.

J. Provide information requested by the CxA for final commissioning documentation.

K. Schedule work so that required installations are completed, and systems verification checks and functional performance tests can be carried out on schedule.

L. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

M. Inspect, check and confirm in writing the proper installation and performance of all Work.

N. Provide technicians to assist during system verification and functional performance testing as required by the CxA

1.7 CxA'S AUTHORITY

A. Directing Commissioning.

B. Assign Commissioning Agent for various commissioning tasks to stand in for the CxA.

C. Edit and approve project-specific construction checklists and commissioning process test procedures for actual Building Mechanical Systems, assemblies, equipment, and components to be provided as part of the construction contract.

D. Verify Testing, Adjusting, and Balancing of Work are complete.

1.8 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for Building Mechanical Systems to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that Building Mechanical Systems and associated controls are ready for testing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that Building Mechanical Systems have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that Building Mechanical Systems instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that Contractor portions of testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing report discrepancies have been corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Provide (Furnish and Install) measuring instruments and logging devices to record test data as directed by the CxA.

3.2 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning tests at the direction of the CxA.

B. Scope of Building Mechanical Systems testing includes entire HVAC&R installation. Testing includes measuring capacities and effectiveness of operational and control functions, accuracy and precision of sensing equipment, and other functional parameters as required, demonstrating that systems are performing as specified and intended. Commissioning testing includes verification of up to 30 percent of the control points, Testing and Balancing data, and other system requirements indicated in the individual technical sections, and on the drawings and schedules of these contract documents. Parameters not otherwise specified to be tested, as required to adequately demonstrate system performance, may constitute up to 10 percent of the 30 percent (3 percent of total).

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the Building Mechanical Systems Contractors and their Subcontractors, especially the Testing, Adjusting, and Balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor, shall prepare detailed testing plans, procedures, and checklists for Building Mechanical Systems based on the actual installed equipment and the contract documents.

E. Perform tests using design conditions whenever possible.

1. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

2. The CxA may direct that set points be altered when simulating conditions is not practical.

3. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

F. If tests cannot be completed because of a deficiency outside the scope of the Building Mechanical System, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests. If deficiencies cannot be resolved, refine tests as required to adequately test Building Mechanical Systems within the constraints of the deficiency.

G. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.3 TESTING, ADJUSTING, AND BALANCING (TAB) VERIFICATION

A. Prior to performance of TAB Work, provide copies of approved sample report forms, checklists, and certificates to the CxA.

B. Notify the CxA at least 10 days in advance of TAB Work, and provide access for the CxA to witness Testing, Adjusting, and Balancing Work.

C. Subsequent to approval of formal TAB report, TAB Work will be subject to field verification. Provide technicians, instrumentation, and tools to verify testing and balancing of Building Mechanical Systems at the direction of the CxA. Roughly 10% of required TAB data points identified in TAB specification will be selected for subsequent field verification.

1. The CxA will notify TAB Subcontractor 10 days in advance of the date of field verification. Notice will not include data points to be verified..

2. The TAB Subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.

3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.

4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.4 SPECIFIC COMPONENT ANS SYSTEM COMMISSIONING TESTS

A. Air Distribution Systems

1. TAB Air Flow Verification:

a. Prerequisites: Completion of "Examination" Article requirements and correction of deficiencies, as specified in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

b. Completion of "Preparation" Article requirements for preparation of a TAB plan that includes strategies and step-by-step procedures, and system-readiness checks and reports, as specified in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

c. Scope: HVAC&R air systems and hydronic piping systems.

d. Purpose: Differential flow relationships intended to maintain air pressurization differentials between the various areas of Project.

e. Conditions of the Test:

1) Commissioning Test Demonstration Sampling Rate: As specified in "Inspections" Article in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

2) Systems operating in full heating mode with minimum outside-air volume.

3) Systems operating in full cooling mode with minimum outside-air volume.

4) For measurements at air-handling units with economizer controls; systems operating in economizer mode with 100 percent outside air.

f. Acceptance Criteria:

1) Under all conditions, rechecked measurements comply with "Inspections" Article in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

2) Additionally, no rechecked measurement shall differ from measurements documented in the final report by more than two times the tolerances allowed.

3) Under all conditions, where the Contract Documents indicate a differential in airflow between supply and exhaust and/or return in a space, the differential relationship shall be maintained.

B. Cooling Generation Systems

1. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of refrigerant compressors and condensers, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested, as required demonstrating that any selected operating performance criteria are met or exceeded.

C. Air System Energy Recovery Systems

1. Energy Recovery Testing and Acceptance Procedures: Testing requirements are specified in Division 23 Section “Testing, Adjusting, and Balancing for HVAC”. Provide submittals, test data, inspector record, and heat exchanger certification to the CxA. Heat exchanger shall exchange the energy flows scheduled with no greater pressure drop or approach temperatures than scheduled.

D. Exhaust Systems

1. Exhaust Fan Testing and Acceptance Procedures: Testing requirements are specified in Division 23 Section “Testing, Adjusting, and Balancing for HVAC”. Provide submittals, test data, inspector record, and exhaust fan performance certification to the CxA. Exhaust fans shall be equipped with all accessories as specified and scheduled and shall be demonstrated to operate on the approved fan curve with no greater than the approved power requirements.

E. Cabinet Unit Heaters

1. Unit Heater Testing and Acceptance Procedures: Testing requirements are specified in Division 23 Section "Testing, Adjusting, and Balancing for HVAC". Provide submittals, test data, inspector record, and Unit Heater performance certification to the CxA. Unit Heaters shall be equipped with all accessories as specified and scheduled and shall be demonstrated to deliver the scheduled airflow and heat capacity at no greater noise or power use levels than specified.

F. Finned-Tube Radiation

1. Finned Tube Radiation (FTR) Testing and Acceptance Procedures: Testing requirements are specified in Division 23 Section "Testing, Adjusting, and Balancing for HVAC". Provide submittals, and test data certification to the CxA. FTR shall be installed level and plumb, neat and secure, with ready access to hydronic specialties as required for service, equipped with all accessories as specified and scheduled and shall be demonstrated to provide the specified and approved heating capacity while operating with no greater than the specified water flow.

G. Vibration, Sound, and Movement Control Systems

1. Coordinate Walk-through with CxA to verify installation is in accordance with specifications and submittals. Provide submittals, test data, inspector record, and Sound Attenuator performance certification to the CxA.

H. Energy Management and Control System

1. Testing requirements are specified in Division 23 Section "Instrumentation and Control for HVAC", Section 3.11 SYSTEM TESTING AND COMMISSIONING. Provide submittals, test data, inspector record, and EMCS performance certification to the CxA.

2. Provide password and any other hardware and software as required to enable CxA to communicate directly, with full graphics and control capability, with the EMCS from the CxA's office over an internet browser interface. Install complete early in project.

END OF SECTION 23 08 00

SECTION 23 09 00 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Review and study all drawings and this entire project specification to become familiar with the equipment and system operation as designed and to verify the quantities and types of controllers, valves, dampers, operators, alarms, points, etc., required.

1.2 SUMMARY

A. The Board of Education of the Waverly School District has decided to purchase controls components, engineering, programming and project management labor from Day Automation Systems Inc, using NYS OGS contract pricing, through NYS OGS Group # 77201, Award # 23150, Contract # PT68783. Products and all other controls system components will in general conform to this specification.

1. State Education Department public bidding requirements include publicly bid installation of standardized equipment purchased by the Owner. Installation of the Energy Management and Control System (EMCS) shall be in full accordance with this specification, by a fully qualified Temperature Controls Contractor (TCC) as described in quality assurance below and as approved by the Architects and Engineers, to be paid for by the Contractor responsible for HVAC Work as a part of their work. Bid installation shall include both removals of existing controls as specified below and installation of new controls as follows:

    a. Control Valves and their actuators.
    b. All control devices: input, output, and logical, including their interface with and mounting in or on piping, sheet metal and general building systems.
    c. All actuation devices for existing valves and dampers should they be involved.
    d. All wiring between all EMCS components and all power source wiring for them.
    e. Removal of all discontinued controls, including but not limited to all pneumatic control air components (piping, compressors, specialties, etc.).

2. Any incidental installations and work not covered above including but not limited to inspecting, testing, and SV acceptance of controls components installation, and controls programming, testing, adjusting, and commissioning labor shall be included in the product portion of this work and shall be provided complete by the state contract vendor, resulting in a complete functional control system per specifications.

B. This section describes the requirements for a complete Energy Management and Control System (EMCS) for building mechanical systems and components, based upon Direct Digital Control (DDC) logic including WEB served operator interface via one new as well as the existing computer Operator Work Stations, distributed microprocessor controls, and integrated electronic components, interfaces, and actuation, all installed complete as specified.

C. Perform all work in cooperation with the Owner, Architect, Construction Manager, and other Prime Contractors. Coordinate all work with the construction schedule established by the Owner, Architect, and Construction Manager, and immediately report any delays including circumstances causing the delays.

D. It is the Owner's intent to establish a fully compatible and interoperable Energy Management and Control System (EMCS) network as an extension of the School District's distributed Day Automation Systems. Accomplish this through the general removal of all existing controls components serving these systems, and providing new controls complete as specified herein. Provide new graphic displays for all new controls, and custom configure graphic displays to meet Owner and Engineer requirements. Provide each of the following portions of the complete EMCS as a standalone system that can communicate with any other Direct Digital Control (DDC) system which is following the same protocol:

1. Operator Work Stations (OWS): Provide one desk top computer as a complete OWS, installed at a location of the Owner's choosing; and integrate this project's controls complete with the EMCS at the District's facilities offices and other buildings. Provide software and programming for new OWS and update software at existing EMCS complete to incorporate this addition. Provide guaranteed seamless two way communications from each, including full control, with the EMCS provided as a part of this project and the existing campus EMCS.

    a. The OWS shall monitor, display, and control information from the EMCS through one software package. Rebooting of the OWS, or opening a separate program to access the existing building's multiple systems is not acceptable.

    b. The new OWS shall meet the hardware and performance requirements of this specification.

    c. The OWS shall allow customization of the system as described in this specification.

    d. The OWS shall:

        1) Provide new color graphic control panels for all equipment provided or modified as part of this project, as outlined below and on the drawings,
        2) Allow operators to view and work with all DDC points associated with all DDC equipment provided or modified as part of this project,
        3) Allow operators to create custom graphics and/or control programming generation for any and all new equipment.

2. Network Control Unit (NCU): Provide central processor WEB server capability for and fully integrated two way communications with all energy use and management equipment provided or modified by this project, along with any third party stand alone controls provided by the manufacturers of the Air Handlers, Refrigeration Machinery, Boilers, and Variable Speed Drives. NCU shall be capable of supporting a minimum of 127 field devices, providing reserve capacity for addition of future points and expansion of DDC system into building. The DDC system's NCU shall communicate with the OWS entirely using the BACnet protocol, with a conformance class of 5, as defined in the latest officially amended version of ANSI/ASHRAE 135-2004.

3. Distributed Controls: System controls shall include but not be limited to all controllers, sensors, devices, wiring, and all other hardware and software required to perform all of the functions and controls described later in this specification and on the drawings, including fully integrated two-way control of boilers, chiller, condensing units, pumps, VSDs, heat exchanger, and all associated temperatures, pressures, and other controllable parameters of mechanical equipment and systems provided or modified as part of this project. Provide control through the EMCS as outlined in the general controls sequences of operations below, as shown on the project drawings, and with controls similar to as shown where the exact configuration is not explicitly covered by the drawing and specification sequence of operations.

4. Engineer's Office: Provide password and any other hardware and software as required to enable Engineer to communicate directly, with full graphics and control capability, with the EMCS from the Engineer's office over an internet browser interface. Install complete early in project. Engineer will utilize to check progress of installation, to check operation of system during the punch list period, and to monitor system operation after completion of the work.

E. DDC: Direct Digital Control.

F. PC: Personal computer.

G. EMCS: Energy Management and Control System, includes the complete automatic temperature control and energy use management system specified herein, based upon DDC technology, incorporating all necessary input and output devices, connecting hardware, software, and accessories.

H. OWS: Operator Workstation which is the main operator interface with the EMCS, comprised of a PC with graphical two way interface with, and data base and control capabilities for, the entire EMCS.

I. UC: Unitary Controller, a version of the SCU which is a smaller microprocessor-based controller, possibly pre-programmed to function specifically for the operation of a particular piece of equipment, such as a standard configuration air handler, unit ventilator, variable air volume box, lighting circuit, etc.

J. SCU: Standalone Control Unit, a microprocessor-based controller panel, which contains all necessary control logic to carry out its own, local functions, and can function independently of other SCU panels and all remaining portions of the EMCS. The SCU may serve one or many types of HVAC equipment and is not factory programmed for only one purpose.

K. NCU: Network Control Unit, a secure central processing unit microprocessor based WEB server residing directly on the Owner's Ethernet TCP/IP LAN/WAN; providing direct communications to SCUs, UCs, and other field devices; integrating and processing their data and presenting it as custom HTML WEB pages in accordance with custom programmed graphical interface edited at an OWS.

L. LAN: Local Area Network - the Owner's existing Ethernet communications backbone which connects all of the owners buildings (and various rooms) on their campus. To be used by the Contractor where possible to connect OWSs, NCUs, SCUs, and UCs. Coordinate with Owner to determine extent of interconnection possible.

M. BACnet: A Data Communication Protocol for Building Automation and Control networks as defined in American National Standard ANSI/ASHRAE 135-1995, including any updates or revisions to this document.

N. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

O. MS/TP: Master slave/token passing.

P. I/O: Input/output.

Q. Modbus: a serial communications protocol originally published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs).

R. PID: Proportional plus integral plus derivative.

S. RTD: Resistance temperature detector.

T. System Modem: a modem which is installed on the EMCS so that a remote SCU, UC, or OWS can connect up to the LAN and can function the same as if it were locally-installed.

U. System Printer: a printing device which is installed on the LAN so that all EMCS components can utilize it as an output device.

V. TCC: Temperature Controls Contractor - The entity responsible for the work described by this section of specifications.

1.3 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.

2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.

3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.

4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.

5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.

6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.

7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.

8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

   a. Water Temperature: Plus or minus 1 deg F.
   b. Space Temperature: Plus or minus 1 deg F.
   c. Ducted Air Temperature: Plus or minus 1 deg F.
   d. Outside Air Temperature: Plus or minus 2 deg F.
   e. Temperature Differential: Plus or minus 0.25 deg F.
   f. Relative Humidity: Plus or minus 5 percent.
   g. Airflow (Pressurized Spaces): Plus or minus 3 percent of reading.
   h. Airflow (Terminal): Plus or minus 10 percent of full scale.
   i. Air Pressure (Space): Plus or minus 0.01-inch wg.

1.4 QUALITY ASSURANCE

A. Provide all labor, material, equipment, software, and programming necessary to meet the functional intent of the EMCS, and the rigid requirements as specified herein and as shown on the drawings. Provide, without additional cost to the Owner, all equipment and labor not specifically referred to herein or on the plans, which are required to meet the functional intent expressed in the sequences of operations herein or on the drawings. The contractor is responsible for all costs of changes in the work required by substitute equipment.

B. The TCC must have been in business for at least ten years, providing DDC systems as their primary business with documented success. They shall have a minimum of five years as a manufacturer's authorized distributor or branch office representative for one or more of the manufacturers specified. They must have a trained staff of application engineers, project managers, software engineers, commissioning staff, training staff, and service staff experienced in the configuration, programming and service of the EMCS. They must have a local service department and stock the manufacturer's standard replacement parts.

C. The EMCS shall be installed only by skilled mechanics employed directly by the TCC except wiring may be installed by their first tier subcontractor under the TCC project manager’s direct supervision. Any subcontractor shall have documented success installing controls with the TCC for a minimum of five years prior to this project. Sub-contractual relations shall in no way relieve the contractor of any of their obligations under their contract.

D. The TCC shall have a training facility with regularly scheduled training as outlined below so as to provide ongoing regularly scheduled application training.

E. Manufacturer must be a firm regularly engaged in manufacture of microprocessor temperature control equipment, of configuration and capabilities similar to or better than specified equipment, for at least ten years, and must have similar earlier vintage models that have been in continuous satisfactory use for not less than ten years in similar service.

F. All work shall conform to the following Codes and Standards, as applicable to the Contracted Work at the Project job site and to the relevant Authorities Having Jurisdiction at the Project site. All products shall be labeled with the appropriate approval markings. In the case of conflict or discrepancy, the latest and most stringent regulation or code shall apply.

1. National Electrical Code (NEC) and applicable local Electrical Codes.
2. Underwriters Laboratories (UL) listing and labels.
3. Underwriters Laboratories of Canada (ULC) listing and labels.
4. UL 864 UUKL Smoke Control.
5. UL 864 UOJZ Fire Protection Signaling Systems.
6. UL-873; Temperature Indication and Regulating Equipment.
7. UL-916; Energy Management Systems for BAS components and ancillary equipment.
8. NFPA 70 – National Electrical Code.
9. NFPA 92A and 92B Smoke Purge/Control Equipment.
10. Factory Mutual (FM).
11. American National Standards Institute (ANSI).
12. National Electric Manufacturer's Association (NEMA).
13. American Society of Mechanical Engineers (ASME).
14. Institute of Electrical and Electronic Engineers (IEEE).
15. American Standard Code for Information Interchange (ASCII).
16. Electronics Industries Association (EIA).
17. Occupational Safety and Health Administration (OSHA).
18. American Society for Testing and Materials (ASTM).
19. Federal Communications Commission (FCC) including Part 15, R.F. Devices.
20. Americans Disability Act (ADA).
21. Uniform Building Code (UBC).
22. NEMA 250 – Enclosures For Electrical Equipment (1,000 V Maximum).
23. NFPA 101 – Life Safety Code.
24. IESNA – Illumination Engineering Society of North America.
25. UL 50 – Cabinets and Boxes.

1.5 GUARANTEES

A. Guarantee the EMCS complete to be free from defects in durability, materials, and workmanship, except for damages from other causes, for a period of one year after final acceptance.

B. Guarantee System to:

1. Maintain temperatures within +/- 1°F of setting, within capacity of HVAC equipment.

C. Provide a one (1) year maintenance agreement to run concurrently with the Guarantee period, consisting of 24 hour emergency service and scheduled service (once per month minimum), as required addressing reported issues, for inspection and adjustment of operating controls, and replacement of parts or instruments found deficient or defective during this period.

D. Provide system backup and restore, software, programming, and sequence of operations enhancements, revisions, and adjustments at no charge to the Owner both during construction and commissioning and during this warrantee period.

1.6 SEQUENCE OF OPERATION

A. Refer to controls schematic drawings including written sequence of operations for specific pieces of equipment. Provide controls as specified and as required to achieve sequence of operations shown on drawings as well as specified below in general programming, and with controls similar to as shown where the exact configuration is not explicitly covered by the drawing and specification sequence of operations.

1.7 SUBMITTALS

A. Submit on controls in multiple portions as job progresses Include in each submittal a summary just inside the cover sheet of previously approved portions of submittal, currently submitted portions, and those portions not submitted yet. During closeout documentation, assemble all approved controls submittals into one package designed for use as both an installation and a maintenance manual.

B. Submit a Technical Proposal within 30 days of contract award or earlier as required for expedited construction schedule, complete with the diagrams, Specification Compliance Reports, product information, and supporting documentation outlined below. Arrange the Technical Proposal in order of the specification article numbers, with tabs (bookmarked .pdf files for electronic submittals) at each division. The Technical Proposal shall be designed for use as both a clear demonstration of qualifications and as an installation and maintenance manual. Progress submittals specified under paragraph 1.8.D below will not be reviewed prior to approval of the Technical Proposal submittal. Do not begin any demolition or new controls work prior to approval of the Technical Proposal.

C. Include the following in a complete Technical Proposal:

1. Description of service capabilities including resumes for service technicians and designers that will be responsible for this project.

2. A list of local jobs (three minimum) of similar type and size the bidder has installed, utilizing the products proposed for this project, with Owner's representatives and engineer of record's names and telephone numbers for reference. This list should directly reflect:

    a. Projects that include direct integration to third party microprocessor controllers of the type specified within this scope.

    b. For all proposed TCCs other than the specified basis of design, include projects with successful complete two-way communication and integration or replacement of the basis of design EMCS, including full transparent control and programming capability from the single workstation.

3. Submit name of any proposed installation subcontractors, along with their statement of qualifications, resumes for service technicians who will be responsible for this project, and 3 local references for comparable recent jobs.

4. EMCS network wiring diagram showing interconnection of all existing and new panels, workstations, system printer(s) etc., describing system architecture for this project with product code numbers for workstation, network controllers, application specific controllers, transducers, sensors, communication networks, etc.. Include all components intended to be used to meet or exceed specification requirements, shown in their functional relation to one another. Obtain from Owner and include the current EMCS system architecture diagram and complete existing control point list prior to any demolition and demonstrate intent to integrate all current control points into the EMCS work.

5. Provide information on owner training provided as part of the bid package as well as additional opportunities and factory schools available with associated costs. Include details of Operator HVAC Training System as specified herein.

6. Specification Compliance Report. The specification compliance report shall address every paragraph within this specification (230900), utilizing an outline format indicating clearly how the proposed system complies with this specification as follows:

    a. No Exception - proposed system complies without exception to both the letter and intent of this specification. Include Data Communications Protocol Certificates certifying that each proposed DDC system component complies with ASHRAE 135.

    b. Substitution Exception - proposed system is believed to meet the functional intent, but not the letter of the specification. For each paragraph for which a Substitution Exception is taken, the Specification Compliance Report shall identify all deviations from what is specified in the given paragraph and provide a complete description of what is included and how the proposed substitution meets the functional intent.

    c. Non-Compliance Exception - proposed system does not meet specification letter or functional intent, and the contractors intent is that the paragraphs requirements will not be provided. For each paragraph for which a Non-Compliance Exception is taken, the Specification Compliance Report shall identify all deviations from what is specified in the given paragraph and provide a complete description of what is included and why the contractor believes their proposed system should still be considered in spite of the non-compliance

    d. For all paragraphs indicated as “No Exception” or “Substitution Exception,” provide and reference factory product documentation to substantiate compliance.

7. Hardware Product Data Bulletins for all specified products, including PC components of OWS. Each bulletin shall describe product features, model numbers and manufacturer’s name.

8. Software Product Data Bulletins for all specified software features. Each bulletin shall describe product features, model numbers, and manufacturer’s name.

D. As job progresses and in ample time for review and iteration as required for complete approval, submit the following:

1. Complete written description of all proposed control sequences and control strategy, with any deviations from the specified sequence of operations highlighted and explained.

2. Detailed wiring and piping control diagrams and system description for each system.

3. Detailed layout and nameplate list for all control panels, including pneumatic, unit-specific controllers, data-gathering panels, microprocessor-based panels, third party microprocessor controllers, etc.

4. Damper schedule giving size, type, velocity, pressure drop, configuration, location, and number, type, and size of motorized actuators. Include apparatus bulletins and data sheets. Include all existing to remain dampers proposed for reuse along with comments on condition.

5. Valve schedule giving valve identification tag abbreviation, location, service, failsafe position, pipe size, valve size, make/model, type, configuration, design flow, capacity index (cv), and pressure drop. Include apparatus bulletins and data sheets.

6. Schedule showing direct integration to all third party microprocessor controllers included in this project, including all points available in a point listing describing point type (analog input, binary input, analog output and binary output), point address, units, applicable software interlocks (alarm, interlock, sequence, etc.), and a verbal description of the function and intended control of the point.

7. Termination schedule and point listing describing point type, (analog input, binary input, analog output and binary output), physical point location (eg. AHU #1 mixed air) and software interlocks (alarm, interlock, sequence, etc.).

8. A complete listing of inputs and outputs, control loops and/or routines, timing functions, and facilities management system functions for each controlled system. This listing shall include point logical names and identifiers.

9. For all equipment, submit copy of written installation, maintenance, and operating directions and details, along with manufacturer's printed installation instructions for all equipment furnished, showing required installation and location of the above items.

10. Provide a sample of program language and description of how programming is accomplished.

11. Color printout sheets of representative samples of all proposed graphics and text based OWS pages.

E. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems.

F. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

1.8 RELATED AND ANCILLARY WORK

A. Electrical control wiring associated with building fire alarm system and duct smoke detectors: Installation is specified under Division 26.

B. Power source wiring for general (non-controls) HVAC motorized equipment: Installation specified under Division 26.

C. Provide power source and controls wiring for all EMCS equipment, complete back to breakers designated as temperature control power breakers on electrical drawings or other approved electrical power panel space. Includes all controls power source wiring, communication wiring, and actuated device power and control wiring. Installation specified both herein and in applicable sections of Division 26.

D. Piping work as required to maintain pressure tight integrity of all hydronic, potable water, and refrigerant based systems for the installation of all piping mounted controls components, including control valve installation, valve and control manifolds, pressure and temperature taps, flow switches, thermal wells, and similar devices: Installation specified both herein and under applicable piping section.

E. Sheet metal work as required to maintain pressure tight integrity of all airside systems for the installation of all airside mounted controls components, including dampers, pressure and temperature probe taps, flow sensors, and similar devices: Installation specified both herein and under applicable sheet metal and ductwork sections.

F. Insulation work as required to maintain the thermal integrity of the various systems associated with and subsequent to controls component installations: Installation specified in Division 23 section on Insulation.

G. For all equipment: Provide and follow written installation directions and details, with manufacturer's printed installation instructions for all equipment furnished, showing required installation and location of the above items.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for submittal, approval, fabrication, and shipping of control devices to equipment manufacturer in ample time for factory installation without impacting project schedule.

B. System Software: Update to latest version of software at Project completion.

1.10 INSTRUCTION AND TRAINING

A. Interactive Operator HVAC Training System

1. General:

a. Provide necessary software and learner workbooks to form a complete HVAC training system as described in this specification. Provide two (2) copies of the software and three (3) copies of the learner workbooks for the Owner's use.

2. Operation:

a. Usable by multiple students while maintaining records and bookmarks for each learner.
b. Operates from CD-ROM without the necessity of installing the program on a hard disk, or installed on hard drive. Students records stored on the computer's hard drive.

3. Features

a. Integrates text and graphics to explain the concepts of building environments, the systems that deliver these environments, and the controls that manage these systems.

b. Modular in design to allow the student to select and view whichever sections are appropriate in any order desired.

c. Menu driven with complete sections identified on the menu.

d. Includes a glossary of terms readily accessible from within the lessons allowing the review of a definition without losing the current lesson location.

e. Incorporates navigational aids including a learning map that allows the student to move directly to a desired section from the map.

f. Includes a password protected registration system to record student responses and bookmark progress. The registration system shall allow students to return to their previous lesson location or start the lesson again when logging on after the first session.

g. Includes a password protected mentor mode which can be used to monitor progress throughout the training program.

h. Includes mastery exam for each of the three sections of the training program; environments, systems, and controls.

i. Includes a final test, enabled by the mentor, to assure satisfactory completion of the learning program.

j. Includes a completion form upon successful completion of the training experience.

B. Factory Authorized Control System Training:

1. Provide factory trained and authorized instructors and control technicians to instruct the Owner's operating personnel.

2. Factory authorized on site training - Provide two (2) on site training sessions each four (4) hours in duration covering network layout, controllers, and software functions. Both generic and product specific training shall be provided. Sessions shall be scheduled by the Contractor at the Owner’s convenience, at any time up to two years after system installation.

3. Provide videotaping and audio taping of all training sessions, both off and on site. Turn over two copies of tapes and three copies of maintenance manual to Owner’s representative.

C. Include in closeout documentation signed letter of acknowledgment of receipt of factory authorized training, videotapes, and maintenance manuals.

1.11 COORDINATION

A. Coordinate all controls work required for a complete operable controls system as specified. Carefully review project summary and scoping documentation and coordinate with contractors responsible for various ancillary portions of controls work. Where supportive or ancillary work is not specifically assigned to another contractor, provide complete as required for a complete operable system.

B. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

C. Coordinate equipment with Division 26 Sections on Electrical Power Monitoring and Control to achieve compatibility of communication interfaces.

D. Coordinate equipment with Division 26 Sections on Panelboards to achieve compatibility with starter coils and annunciation devices.

E. Coordinate equipment with Division 26 Sections on Motor Controls to achieve compatibility with motor starters and annunciation devices.

F. Coordinate size and location of concrete bases. Refer to Section 23 05 00 "Common Work Results for HVAC Systems: for additional information.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Standardized Vendor (SV):

1. Schneider Electric Controls as installed by Day Automation.

B. In other Part 2 articles where specific components are described, the basis of design and named equivalent TCCs integrate multiple manufacturers' components into a coherent system. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified:

1. TAC/Andover Controls Corporation.
2. Armstrong.
3. Automated Logic Corporation.
4. Functional Devices Inc.
5. Honeywell International Inc.; Home & Building Control.
6. Invensys Building Systems.
7. Johnson Controls, Inc.; Controls Group.
8. KMC Controls/Kreuter Manufacturing Company.
9. McQuay International.
10. Siemens Building Technologies, Inc.
11. Solidyne Corp.
12. Staefa Control System Inc.; Siemens Building Technologies, Inc.
13. TAC Americas, INC.
14. TCS/Basys Controls.
15. Tekmar Control Systems, Inc.
16. Teletrol Systems Incorporated.
17. Tour & Andersson Control, Inc.
18. Trane; Worldwide Applied Systems Group.
19. Triangle MicroSystems, Inc.
20. Victaulic, Inc.
21. Voltec, Inc.

2.2 GENERAL SYSTEM ARCHITECTURE

A. The EMCS shall consist of the following:

1. Operators' Workstations (OWS).

2. File Server (FS).

3. Network Control Units (NCU).

4. Standalone Control Units (SCU).

5. Application Specific Unitary Controllers (UC).

6. All controls power wiring 120 volts or less, all network and communication wiring, fiber optic cable, and other controls communication media.

7. All EMCS communications devices.

8. All related field devices including remote I/O cabinets, transformers and power supplies, relays, contactors, transducers, switches, cabling, and related electronic control equipment.

9. All necessary software and custom programming, including graphics and reports.

10. All necessary inputs, outputs, and devices required to meet the features and intent described herein including but not limited to:

    a. Transducers.
    b. Water flow switches and sensors.
    c. Differential Pressure sensors.
    d. Hydronic control valves.
    e. Opposed blade (control) or parallel blade (shutoff), low leakage dampers.
    f. Temperature, pressure, and humidity sensors and safety devices.
    g. Electronic valve and damper actuators.

11. All other equipment necessary for a complete, operational, EMCS.

B. The design of the EMCS shall network OWSs, FCs, NCUs, SCUs, UCs, and all sensors, safeties, actuators, and other devices. Inherent in the system's design shall be the ability to expand or modify the network via the Internet, the Level 1 LAN, the Level 2 bus, or via auto e-mail or auto-dial telephone line modem connections, or via a combination of all four networking schemes. LAN communications between buildings shall be standard ETHERNET TCP/IP and shall be compatible with the district's existing ETHERNET LAN.

C. The EMCS shall:

1. Be modular in nature, with distributed controllers operating in multi-user, multi-tasking environment on token-passing network.

2. Be re-programmable and programmed to control mechanical, electrical, and plumbing systems.

3. Be capable of integrating multiple building functions, equipment supervision and control, alarm management, energy management, historical data collection, and archiving.

4. Permit expansion of both capacity and functionally through the addition of components and programming.

5. Include an operator workstation which permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

6. Not be dependent upon any single device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

D. The system architecture shall consist of no more than two communication levels as follows:

1. Level 1 shall be on the Owner's ETHERNET LAN as possible within the constraints of this specification. Contractor shall field verify extent and capacity of existing LAN with Owner prior to creation of network layout drawings, and shall include any and all extensions of the LAN required for complete and robust functioning of the EMCS:

   a. Level 1 communications shall use the BACnet protocol.

   b. This LAN operates under ETHERNET protocol at 10 Mbps or other speed as determined by the Owner. The Level 1 LAN will provide transfer of point data, alarms and file activity among OWSs, NCUs, and SCUs.

   c. Any data from a Level 2 controller can also be transmitted onto this bus through a Level 1 controller. The high speed LAN shall support multi-user communications and multi-session activity. That is, all global data sharing shall occur simultaneously with the transmission of alarm data or user activity.

   d. OWSs and NCUs shall reside directly on the LAN such that communications may be executed directly between controllers, directly between workstations, and between controllers and workstations, on a peer-to-peer basis.

   e. SCUs and UCs may reside directly on the Level 1 Lan at the TCCs option.

2. Level 2 shall be on a EIA-485 bus or other comparable technology, designed to support a family of dedicated local controllers for control of HVAC equipment and lighting. The Level 2 bus shall communicate bi-directionally with the Level 1 LAN through NCU controllers for transmission of global data:

    a. The Level 2 bus, or field bus, shall support local control units (SCUs and UCs) of modular size for operation of the building's HVAC and lighting systems. This bus shall operate at a minimum speed of 200 kbps with a length of 4000 feet and 10Mbps with a length of 150 feet, with 32 nodes before requiring a network repeater. A minimum of 127 controllers shall be configurable on the field bus.

    b. The field bus shall permit peer-to-peer communications among all Level 2 controllers and allow simultaneous communications with portable computer service tools that are connected to a Level 2 controller. Failure of any Level 1 NCU controller shall not impair the operation of its associated field bus.

    c. All Level 2 field wiring that connects non native BACnet unitary controllers shall have an additional wiring set run in parallel dedicated for future use by native BACnet replacement controllers.

E. NCUs shall be able to access any data from, or send control commands and alarm reports directly to any other NCU or combination of NCUs on the network without dependence upon a central processing device. NCUs shall also be able to send alarm reports to multiple operator workstations without dependence upon a central processing device.

F. Dynamic Data Access:

1. All operator devices, network resident, internet connected, or connected via dial-up modems, shall have the ability to access all point status and application report data, or execute control functions for any and all other devices via the LAN. Access to data shall be based upon logical identification of building equipment.

2. Access to system data shall not be restricted by the hardware configuration of the EMCS. The hardware configuration of the EMCS network shall be totally transparent to the user when accessing data or developing control programs.

3. All points contained on Level 1 and Level 2 controllers shall be considered global points. Any program in any controller on the network shall be able to reference any point in any controller regardless of its location on the network.

G. General Network Design:

1. Network design shall include the following provisions:

    a. Data transfer rate for alarm reporting, report generation from multiple controllers, and upload/download between SCUs and OWSs shall be a minimum of 2.5 Megabaud.

    b. Support of any combination of controllers and operator workstations directly connected to the local area network. A minimum of 50 devices shall be supported on a single local area network.

c. Detection and accommodation of single or multiple failures of either OWSs, SCUs, or the network media. The network shall include provisions for automatically reconfiguring itself to allow all operational equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.

d. Message and alarm buffering to prevent information from being lost.

e. Error detection, correction, and re-transmission to guarantee data integrity.

f. Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.

g. Commonly available, multiple sourced, networking components and Ethernet protocols shall be used to allow the EMCS to coexist with other networking applications on the Owner's existing LAN/WAN. Ethernet and BACnet are acceptable technologies. BACnet system shall conform to the latest ASHRAE Standards and recommendations.

h. Use of an industry standard IEEE 802.x protocol.

i. Provide synchronization of the real-time clocks in all EMCS panels.

2.3 OPERATOR WORK STATION (OWS)

A. Provide FCC certified class B computer systems as the OWS to control operator input/output, data storage and transmission to and from the system controllers, and to perform all software functions as noted hereafter. Provide hardware and software commercially available nationally from local vendors, with repair parts and service available locally from these vendors. Provide computer products by one of the following:

1. Apple or equal.
2. Dell or equal
3. Gateway or equal.
4. Hewlett Packard or equal.
5. IBM or equal

B. Central Server Computer:

1. Dimensions to fit standard 2S-2U slots.

2. Single 750w Hot Plug Power supply, complete with UPS.

3. INTEL Core i7 3.8 GHz minimum, 8MB L2 cache microprocessor

4. Minimum 32GB dual-channel DDR3 1600MHz SDRAM memory.

5. Provide four (4) internal minimum 500 GB, 7200rpm SATA 3Bbps 3.5 Hot-Plug with 12 – Hot Swap hard disk drives, with average access time of less than 30 milliseconds for storage of primary system data base and operating parameter files.

6. Provide two (2) parallel and two (2) serial communications ports. The serial communications ports shall be capable of transfer rates of at least 9600 baud (RS-232-C standard). Provide at least four unused USB 2.0 ports.

7. Provide built-in ethernet networking capabilities (10/100Mbits) and wireless capability.

C. Desktop Workstation Computer:

1. INTEL Core i7 3.8 GHz minimum, 8MB L2 cache microprocessor.

2. Minimum 32GB dual-channel DDR3 1600MHz SDRAM memory.

3. The CPU shall be for desktop use and shall have at least three (3) unused expansion slots.

4. Provide an Integrated AC'97 Full-Duplex Audio card.

5. Provide a 13 in 1 media reader.

6. Provide an on board Combo Drive: 40x/10x/24x CD-RW and 8x DVD-ROM.

7. Provide two (2) internal minimum 500 GB each, 7200rpm or solid state hard disk drives, with average access time of less than 30 milliseconds.

8. Provide two (2) parallel and two (2) serial communications ports. The serial communications ports shall be capable of transfer rates of at least 9600 baud (RS-232-C standard). Provide at least four unused USB 2.0 ports.

9. Provide built-in ethernet networking capabilities (10/100Mbits) and wireless capability.

10. Provide graphics controller similar to 4GB NVIDIA® GeForce® GTX 745 DDR3.

11. Accessories:

a. Provide a 24” flat panel monitor, backlit LCD, TFT, Midnight Gray, Up to 1920x1080 Pixels, 0.27 mm Pixel Pitch, Anti-glare with Hard Coating, 15-Pin D-Sub / 24-Pin DVI-D / S-Video / Composite Video / USB 2.0 Connectors.

b. Provide a black and white laser printer with parallel interface, twelve pages per minute minimum at 1200 dpi equivalent, ½ ream paper storage minimum, dual side printing.

c. Provide a 101-key enhanced style keyboard capable of generating all the standard ASCII characters. Function keys "F1" through "F12" and numeric keyboard shall also be a part of keyboard.

d. Provide stereo speakers.

e. Provide an optical mouse, two buttons and wheel, to serve as the pointing device.

f. Provide a UL listed 1500 VA minimum UPS with surge protector, with at least six (6) electrical outlets, one (1) cable outlet, and one (1) modem outlet.

D. Operator Workstation Software

1. Operating System: Microsoft Windows 10 Business / Enterprise Professional, or comparable OS (verify with Owner and provide system compatible with Owner's IT system), with high-speed Internet access.

2. EMCS Application Software General Requirements:

   a. The software shall communicate with the existing EMCS over the Owner's LAN using ASHRAE 135 and ISO 8802-3 (Ethernet) datalink/physical layer protocols.

   b. The software shall be a standard application for the off the shelf MS Windows OS selected above, and shall not require a dedicated OWS, nor a different operating system from the Owner's other office management software.

   c. Standard utility software packages shall be available through local retail outlets.

   d. The OWS shall output advisories and unacknowledged change-of-state or out-of-limits occurrences in a dedicated and protected area of the viewing screen.

   e. Graphical and Text Based Displays: At the option of the user, Operator workstation shall provide consistent graphical or text based displays of all system points and application data described in this specification. Point identification, engineering units, status indication and application naming conventions shall be the same at all workstations.

   f. Individual point information shall be coded via eight different colors. These colors shall be defined with respect to system type and condition.

   g. Multiple, Concurrent Displays: provide the ability to simultaneously view several different types of system displays in overlapping windows to speed building analysis. For example, provide the ability to simultaneously display a graphic depicting an air handling unit, while displaying the trend graph of several associated space temperatures to allow the user to analyze system performance. If the interface is unable to display several different types of displays at the same time, the TCC shall provide at least two networked operator stations.

   h. Employ browser-like functionality for ease of navigation, with a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. Provide menu-pull downs and toolbars, "hot-button" commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System or basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

   i. Provide for modifying common application objects, such as schedules, calendars, and set points in a graphical manner, for example using a graphical slider, without requiring operator keyboard entry.

3. Application Software Features:

a. Security:

1) The software shall be designed so that up to 256 users of the software can each have a unique username and password. Each username/password combination shall be linked to a set of capabilities within the software, set and editable only by a system administrator. The sets of capabilities shall range from View only, Acknowledge alarms, Enable/disable and change values, Program, and Administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. Passwords shall be changeable through on-line keyboard entry by either the individual user or the administrator.

2) There shall be an adjustable inactivity timer that automatically logs off the current operator after the timer has expired.

3) Record all operator inputs executed under a valid password in a data log, including operator name.

4) At no time shall the actual password numbers be printed on the screen, except for operators with the strictest level of password, who shall be able to generate a password summary listing.

a) The password summary shall include at least a 24-character name, login ID, password, time out value, and security level.

5) Passwords shall be exactly the same for all operator devices, including stationary or portable OWS, or panel mounted network terminals. Any additions or changes made to password definition shall automatically cause passwords at all EMCS panels on a network to be updated and downloaded to minimize the task of maintaining system security. Users shall not be required to update passwords for EMCS panels individually.

6) Operators will be able to perform only those commands available for their respective passwords. Menu selection displayed at any operator device, including portable or panel mounted devices, shall be limited to only those defined for the access level of the password used to log on.

7) Provide user definable, adjustable, automatic log off timer to activate after from 1 to 60 minutes of inactivity (adj.), to prevent operators from inadvertently leaving devices online.

b. I/O capability from each OWS

c. Automatic system diagnostics; monitor system and report failures.

d. Database creation and support.

e. Automatic and manual database save and restore.

f. Object and property status and control.

g. Automatic restart of field equipment on restoration of power.

h. Custom report development.

i. Utility and weather reports.

j. Workstation application editors for controllers and schedules.

k. Maintenance management.

l. Trend logs: Support customized trend log reports with variables assignable at the OWS, automatic archive of trended values, with data retrievable in spreadsheets and database programs.

m. Data collection, reports, and logs. Include standard reports for the following:

1) Current values of all objects.
2) Current alarm summary, sorted by priority.
3) Alarm history.
4) Disabled objects.
5) Alarm lockout objects.
6) Logs.

n. Summaries:

1) System log shall log the status of points within system.
2) Alarm summary shall log specified alarm points which are actually in alarm.
3) Off-normal summary shall log points specified by the operator to be in the off-normal mode.
4) Lockout summary shall log points specified to be in the lockout condition.

o. Messages:

1) The system shall support a minimum of 500 different automatic messages defined by the authorized operator on-line via word processing editor with minimum available length of 256 alpha-numeric characters. Messages shall also indicate whether acknowledgment is necessary.

2) Messages may be assignable as pop-up reactions to operator inputs, system alarms, event processes, and other system messages as required and deemed useful by the programmer, Engineer, and Owner.

p. Totalization:

1) The energy management system shall allow for analog or digital point totalization with respect to time.

2) Run time totalization shall be provided to track the run time of point assigned. A summary shall be generatable listing run time points and their present values.

3) Analog totalization shall be provided to measure analog data over real time span. A summary shall be generatable which lists analog totalization points and their current period values, current dry values, previous period and previous day totalized values.

4) Provide customized totalization reports for each major HVAC system.

q. Scheduling:

1) The system shall be capable of initiating equipment based on a preselected time-of-day schedule. This program shall provide scheduling for seven days of the week with 500 unique schedules. The user shall not be required to enter control programs to alter time-of-day schedules.

2) Provisions shall be made to program in holidays up to one year in advance; up to 366 consecutive holidays shall be enterable.

3) On-Line Graphic Generation:

4) This program shall allow the operator to generate color graphics on-line using symbols selected from a standard library of symbols.

4. Energy Management Features: The following energy management programs shall reside in the OWS for global control purposes:

a. Demand limiting program shall monitor total demand at the on-site meter and reduce load, if possible, to maintain a fixed value.

b. Duty cycling program shall periodically turn selected loads off to reduce energy consumption.

c. Optimal run time program shall control the start-up and shutdown of HVAC equipment based on the most energy efficient schedule. Startup shall be staggered to minimize inrush currents.

d. The energy management program shall not allow the energy management features listed above to shut down air systems (air handling units, unit ventilators, cabinet heaters, etc.) which are providing ventilation air to the occupied spaces during the occupied cycle.

e. Programs shall be supervised by an energy management program, which shall oversee the execution of global energy management functions. These programs may also reside in individual field panels on systems of this architecture. If the host computer is to act only in a supervisory mode, specific panels shall be assigned to global function duty.

5. Custom Application Software:

   a. English language oriented.
   b. Full-screen character editor/programming environment.
   c. Allow development of independently executing program modules with debugging/simulation capability.
   d. Support conditional statements.
   e. Support floating-point arithmetic with mathematic functions.
   f. Contains predefined time variables.

6. Control Programming: Definition of operator device characteristics, EMCS panels, individual points, application, and control sequences shall be performed through fill-in-the-blank templates and a graphical programming approach. Allow the user to define the software configuration of EMCS panel logic for HVAC system control sequences, fan interlocks, pump interlocks, PID control loops, and other control relationships through the creation of graphical logic flow diagrams.

   a. Graphical Programming: Control sequences are created by using a mouse input device to draw interconnecting lines between symbols and depicting inputs, operators (comparisons and mathematical calculations), and outputs of a control sequence. As a minimum, graphic symbols shall be used to represent:

      1) Process inputs, such as temperature, humidity, or pressure values, status, time, date, or any other measured or calculated system data.
      2) Mathematical process operators, such as addition, subtraction, multiplication, or greater than, equal to, or less than, etc.
      3) Logical process operators such as IF, AND, OR, ELSE, GO TO, Exclusive OR, NOT, etc.
      4) Time delays.
      5) Process control outputs such as start/stop control points, analog adjust points, etc.
      6) Process calculation outputs.
      7) Text file outputs and advisories.

   b. Network-wide Strategy Development: Inputs and outputs for any process shall not be restricted to a single EMCS panel, but shall be able to include data from any and all other EMCS panels to allow the development of network wide control strategies. Processes shall also allow the operator to use the results of one process as the input to any number of other processes (cascading).

   c. Sequence testing and simulations: Provide a software tool which allows a user to simulate control sequence execution to test strategies before they are actually applied to mechanical systems. Users shall be able to enter hypothetical input data and verify desired control response and calculation results via graphical displays and hard copy printouts.

7. Dynamic Color Graphic Displays:

   a. Provide graphics generation software to allow the user to add, modify, or delete system graphic displays that include any manipulated point data from any networked EMCS panels, including SCUs or Ucs. Develop graphic screens using any drawing package capable of generating a GIF, BMP, or JPG file format, including AutoCadd and Visio. Use of proprietary graphic file formats shall not be acceptable. In addition to a graphic background, support the use of scanned pictures.

   b. Provide for simultaneous viewing of several graphics at the same time (windowing) to analyze total building operation, or to allow display of a graphic associated with an alarm to be viewed without interrupting work in progress.

   c. Provide libraries of pre engineered screens and symbols depicting standard air handling unit components (e.g., fans, cooling coils, filters, dampers, etc.), complete mechanical systems (e.g., constant volume terminal reheat, VAV, etc.) and electrical symbols.

   d. The graphic development package shall use a mouse or similar pointing device in conjunction with a drawing program to allow the user to perform the following:

      1) Define symbols
      2) Position and size symbols
      3) Define background screens
      4) Define connecting lines and curves
      5) Locate, orient, and size descriptive text
      6) Define and display colors for all elements
      7) Establish correlation between symbols or text and associates system points or other displays.

   e. Each graphic display shall consist of a static section and a dynamic section. The static section shall consist of elements which usually do not change with time or point condition. The dynamic section shall consist of elements which usually do change with point conditions, and shall be integrated with the respective static section, appearing in appropriate locations in it.

      1) A minimum capability of 256 different static sections shall be provided. Each static section shall be capable of being associated with any number of dynamic sections. The elements of a static section shall be capable of outputting in any one of eight different colors. A static section does not have to be associated with a dynamic section to be used as chromatic output. The elements of static sections shall include, but not be limited to: lines, line drawings, symbols, and character strings (single/double sized).

2) The dynamic section shall accommodate a minimum of 40 elements. The elements of a dynamic section shall be capable of outputting in any one of the eight colors. Symbols shall be a pictorial illustration of the point condition. This illustration shall not be dependent on the type of sensor/device being represented. The elements of a dynamic section shall include, but not be limited to: point identifier, point expanded identifier (if abbreviated), analog value, engineering units, mode units, symbols, lines, text strings. Dynamic temperature values, humidity values, flow values, and status indication shall be shown in their actual respective locations, and shall automatically update to represent current conditions without operator intervention.

3) System graphic display shall update the dynamic elements to the current point condition, at least every 30 seconds. System shall include a list of standard symbols. Lines shall include, but not be limited to: vertical, horizontal, diagonal, curved. Character strings shall include alpha/numeric characters and shall be capable of 60 characters minimum length.

4) Dynamic element shall be capable of being used a multitude of times on a single chromatic display and shall be stored in a symbols library program.

f. When a point is in alarm on the screen, the OWS shall be able to display an alarm graphic with a minimum number of keystrokes. Alarm graphic individual point information shall include, but not be limited to: point identification, point location, alarm point value, alarm limit value, engineering units (°F, KWH, etc.), mode units (on/off, alarm).

8. Web Browser Features:

a. On-Line Help: Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.

b. Security: Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

c. System Diagnostics: The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

d. Alarm Console:

1) The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.

2) When the Alarm Console is enabled, a separate alarm notification window will supercede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

9. Web Browser Clients

a. The system shall be capable of supporting at least 64 clients using a standard Web browser such as Internet Explorer or Netscape Navigator. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, are only acceptable if 64 licensed copies of the client machine software are provided, installed, and tested. The system shall support a minimum of ten (10) simultaneous clients.

b. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the EMCS, shall only be acceptable if 64 workstation or workstation hardware upgrades are provided.

c. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

d. The Web browser client shall support at a minimum, the following functions:

1) User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.

2) Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.

3) HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.

4) Storage of the graphical screens shall be in the Building Control Units (BC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

5) Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.

6) Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

   a) Modify common application objects, such as schedules, calendars, and set points in a graphical manner.

   b) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

   c) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

   d) Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

   e) View logs and charts

   f) View and acknowledge alarms

7) The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

8) Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.4 NETWORK CONTROL UNITS (NCUs)

A. General: Network Control Units shall be microprocessor based, multi-tasking, multi-user, and employ a real time operating system. Each NCU control panel shall consist of modular hardware including power supply, CPU board, and input/output modules. A sufficient number of NCUs shall be supplied to fully meet the requirements of this specification and the controls requirements shown on the drawings.

   1. Basis of design NCUs: Schneider Electric Continuum bCX1-CR-xxx with InfbCX1 controller.

B. Webserver Functionality: All NCUs shall reside directly on the Owner's Ethernet TCP/IP LAN/WAN and shall be capable, out-of-the box, to be set up as a Web Server. The NCU shall have the ability to store HTML code and "serve" pages to a web browser. Provides the ability for any computing device utilizing a TCP/IP Ethernet connection and capable of running a standard Internet browser (Microsoft Internet Explorer™, Netscape Navigator™, etc.) to access real-time data from the entire BAS via any NCU.

1. Graphics and text-based web pages shall be constructed using standard HTML code. The interface shall allow the user to choose any of the standard text or graphics-based HTML editors for page creation. It shall also allow the operator to generate custom graphical pages and forms.

2. The WEB server interface shall be capable of password security, including validation of the requesting PC's IP address. The WEB server interface shall allow the sharing of data or information between any controller, process, or network interface (BACnet, LonTalk and TCP/IP) that the BMS has knowledge of, regardless of where the point is connected on the BAS network or where it is acquired from.

3. The BAS network controller must act directly as the WEB server. It must directly generate HTML code to the requesting user (i.e., WEB browser), eliminating the need for and reliance on any PC-based WEB server hardware or software. To simplify graphic image space allocation, HTML graphic images, if desired, shall be stored in any shared network device. The BAS Web server shall have the ability to acquire any necessary graphics using standard pathing syntax within the HTML code mounted within the BAS WEB server. External WEB server hardware and software are not acceptable.

C. Hardware Specifications

1. Memory: A minimum of 4MB of RAM shall be provided for NCUs with expansion up to 8MB. The 8MB versions shall include a floating-point math co-processor.

2. Communication Ports: Each NCU shall provide communication to both the Workstation(s) and the field buses. In addition, each NCU shall have at least three other communications ports that support a telephone modem, portable service tool, serial printer and connection to third party controllers such as a chiller control panel. On a LAN/WAN system, the NCU shall be provided with a 10Mbps plug-in Ethernet TCP/IP network interface card (NIC).

3. Input/Output (I/O): Each NCU shall support the addition of the following types of inputs and outputs:

   a. Digital Inputs for status/alarm contacts
   b. Counter Inputs for summing pulses from meters.
   c. Thermistor inputs for measuring temperatures in space, ducts and thermowells.
   d. Analog inputs for pressure, humidity, flow and position measurements.
   e. Digital Outputs for on/off equipment control.
   f. Analog Outputs for valve and damper position control, and capacity control of primary equipment.

4. Modular Expandability: The system shall employ a modular I/O design to allow easy expansion. Input and output capacity is to be provided through plug-in modules of various types or DIN-mountable IOU modules. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.

5. Real Time Clock (RTC): Each NCU shall include a battery-backed, real time clock, accurate to 10 seconds per day. The RTC shall provide the following: time of day, day, month, year, and day of week. In normal operation, the system clock shall be based on the frequency of the AC power. The system shall automatically correct for daylight savings time and leap years and be Year 2000 compliant.

6. Power Supply: The power supply for the NCUs shall be auto sensing, 120-220VAC, 60/50 Hz power, with a tolerance of +/- 20%. Line voltage below the operating range of the system shall be considered outages. The controller shall contain over voltage surge protection, and require no additional AC power signal conditioning. Optionally, if indicated on the drawings, the power supply shall accept an input voltage of (–48 VDC).

7. Automatic Restart After Power Failure: Upon restoration of power after an outage, the NCU shall automatically and without human intervention: update all monitored functions; resume operation based on current, synchronized time and status, and implement special start-up strategies as required.

8. Battery backup: Each NCU with the standard 120-220VAC power supply shall include a programmable DC power backup system rated for a minimum of 72 hours of battery backup to maintain all volatile memory or, a minimum of 2 hours of full UPS including modem power. This power backup system shall be configurable such that at the end of a settable timeframe (such as 1 hour) of running on full UPS, the unit shall shut off full UPS and switch to memory retention-only mode for the remainder of the battery power. The system shall allow the simple addition of more batteries to extend the above minimum battery backup times.

D. Software Specifications

1. General: The NCU shall contain flash ROM as the resident operating system. Application software shall be RAM resident. Application software shall only be limited by the amount of RAM memory. There shall be no restrictions placed on the type of application programs in the system. Each NCU shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, etc.

2. User Programming Language: The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be English language-based and programmable by the user. The language shall be structured to allow for the easy configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, passwords, and histories. The language shall be self-documenting. Users shall be able to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings.

E. Control Software:

1. The NCU shall have the ability to perform the following pre-tested control algorithms:

    a. Proportional, Integral plus Derivative Control (PID)
    b. Two Position Control
    c. Digital Filter
    d. Ratio Calculator
    e. Equipment Cycling Protection

2. Mathematical Functions: Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, Boolean logic statements, or combinations of both. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These shall be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

3. Energy Management Applications: NCUs shall have the ability to perform any or all of the following energy management routines:

    a. Time of Day Scheduling
    b. Calendar Based Scheduling
    c. Holiday Scheduling
    d. Temporary Schedule Overrides
    e. Optimal Start
    f. Optimal Stop
    g. Night Setback Control
    h. Peak Demand Limiting
    i. Free Cooling

4. History Logging: Each controller shall be capable of logging any system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system variables (inputs, outputs, math calculations, flags, etc.) can be logged in history. A maximum of 32,767 values can be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logs can be automatic or manual. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

5. Alarm Management: For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms shall be tested each scan of the NCU and can result in the display of one or more alarm messages or reports.

6. Up to 8 alarms can be configured for each point in the controller.

    a. Messages and reports can be sent to a local terminal, to the front-end workstation(s), or via modem to a remote-computing device.

    b. Alarms shall be generated based on their priority. A minimum of 255 priority levels shall be provided.

c. If communication with the Operator Workstation is temporarily interrupted, the alarm shall be buffered in the NCU. When communications return, the alarm shall be transmitted to the Operator Workstation if the point is still in the alarm condition.

7. Reporting: The NCU shall be able to generate user-definable reports to a locally connected printer or terminal. The reports shall contain any combination of text and system variables. Report templates shall be able to be created by users in a word processing environment. Reports can be displayed based on any logical condition or through a user command.

2.5 STANDALONE CONTROL UNIT (SCU) PANEL

A. SCUs shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors designed to integrate multiple Unitary Controllers, provide central processing capacity and integration of distributed processing, and interface directly with the system OWS and LAN.

B. Each SCU panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules. A sufficient number of controllers shall be supplied to fully meet the requirements of this specification.

C. The basic elements of the direct digital control system structure shall consist of standard components kept in inventory by the equipment supplier. The components shall not require customizing other than setting jumpers and switches, adding firmware modules or software programming to perform required functions.

D. The system shall be capable of being expanded to its full capacity by adding sensors and entering programs in available random access memory (RAM). Future expansion shall not require hardware modifications to the controller.

E. SCU shall be listed in accordance with UL 864 as required to provide direct control of all smoke dampers.

F. Memory: Provide with sufficient memory to meet system performance requirements and support its own operating system, database system, and database including:

1. Control processes
2. Energy management applications
3. Alarm management
4. Historical/trend data for all points
5. Maintenance support applications
6. Custom processors
7. Operator I/O
8. Dial-up communications
9. Manual override monitoring

G. Point Types: Support the following types of point inputs and outputs:

1. Digital inputs for status/alarm contacts
2. Digital output for on/off requirement control
3. Analog inputs for temperature, pressure, humidity, flow and position measurements.
4. Analog outputs for valve and damper position control, and capacity control of primary equipment.
5. Pulse inputs of pulsed contact monitoring.

H. Expandability:

1. The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators.

2. The system architecture shall support expansion capacity of all type of SCU panels, and all point types included in the initial installation.

I. Serial Communication Ports: Provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such a industry standard printers, laptop workstations, PC workstations, and panel mounted or portable Operator's Terminals. SCU panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.

J. Hardware Override Switches:

1. Provide the ability to manually override automatically executed commands at the SCUs via local, point discrete, onboard hand/off/auto operator override control via local keypad function for binary control points and with modulating control for analog control type points.

K. Hardware Override Monitoring:

1. SCU panel shall monitor the status or position of all override, and include this information in logs and summaries to inform the operator that automatic control has been inhibited. EMCS panel shall also collect override activity information for daily and monthly reports.

L. Local Status Indicator Lamps:

1. The SCU panel shall provide local status indication for each binary input and output for content, up-to-date verification of all point conditions without the need for an operator I/O device.

M. Integrated On-Line Diagnostics:

1. Each SCU panel shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all subsidiary equipment. The SCU panel shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each SCU panel, and shall not require the connection of an operator I/O device.

N. Sure and Transient Protection:

1. Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induces voltage transient consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all single wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

O. Power failure:

1. In the event of the loss of normal power, there shall be an orderly shutdown of all SCU panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

2. Upon restoration of normal power, the SCU panel shall automatically resume full operation without manual intervention.

P. No digital control panel shall be loaded to more than 80% of its total available point capacity of the digital/analog/input/output sections.

Q. The SCU shall perform its assigned control and energy management functions as a stand-alone unit. Stand-alone control shall include, but not be limited to:

1. Supply and/or water reset.
2. Adaptive optimal start.
3. Time of day start/stop.
4. Zero energy band.
5. Night purge/warm-up.
6. Duty cycle.
7. Control valve, damper, motor and alarm capabilities.

R. EMCS Shall Operate Within The Following Limits:

1. Temperature 32°F to 120°F.
2. Humidity 0 to 95% RH.
3. Voltage +/- 10%.

S. Control algorithms shall be available and resident in the EMCS to permit proportional, integral, derivative, incremental, floating and two position control modes in combination to meet the need of the application and to adapt to job conditions.

T. Control shall be performed in a digital manner using the digital signal from the microprocessor based controller converted through electronic circuitry for modulation of electric or pneumatic actuators. This may take the form of a pulse width modulated signal or a true analog signal generated through a D/A convertor. Electro-pneumatic transducers used for pneumatic outputs shall be cabinet mounted either within the controller or in separate cabinet located immediately next to the digital control panel.

U. Adjustments of control variables shall be available at the controller with the modem through a non-intelligent terminal. Hand held or mounted in cabinet face. If hand held devices are provided two shall be furnished. These adjustments shall include, but not be limited to, setpoints, proportional gain, integral rates, the velocity and acceleration constants associated with incremental control and on/off values of two-position control.

V. The controller shall contain necessary mathematic, logic, utility functions, all standard energy calculations and control functions in ROM. These should be available in combination for programming the unit. These routines shall include, but not be limited to:

1. Math routines:

    a. Basic arithmetic.
    b. Binary logic.
    c. Relational logic.
    d. Fixed formulas for psychrometry.
    e. Calculations.

2. Utility routines for:

    a. Process entry and exit.
    b. Keyboard functions.
    c. Variable adjustments and output.
    d. Alarm indication.
    e. Restart.

3. Control routines for:

    a. Signal compensation.
    b. Loop control.
    c. Energy conservation.
    d. Timed programming.

W. Final field programs shall be stored in battery backed up RAM. The EMCS (SCUs, UCs, etc.) shall be supplied with a minimum of eight hours of battery backup for the RAM with an automatic battery charger.

X. The EMCS shall be expandable by adding additional SCUs, UCs, etc., that operate through the processor of the EMCS.

Y. Provide digital sensors, differential air and/or water flow switches, space temperature sensors (30°F to 90°F), outside and air temperature sensors (-30°F to 120°F), hot water temperature sensor (0°F to 300°F), chilled water sensors (30°F to 90°F), humidity sensors, static pressure sensors, and other sensors and switches required to perform functions as specified.

Z. Provide transducers, EP switches, devices, required by the EMCS to position the control elements.

AA. Provide electric and pneumatic interface devices.

BB. The EMCS software shall contain a self-test procedure for checking the annunciator lights on the digital display, and the computer.

CC. Variable shall be identified as being reliable or unreliable. When a calculation is required to use a value (sensed or calculated), which is identified as being unreliable, the unreliable data value will flash. The calculation will use a default value programmed into the unit.

DD. Alarms (e.g., a pump that did not start) and deviation alarms (e.g., temperature out of limits) will be annunciated.

EE. The SCUs, UCs, shall be enclosed in a metal cabinet. The cabinet shall be constructed such that it can be mounted and electrical terminations made during the construction phase of the project.

FF. The EMCS cabinet shall be a hinged metal type with a baked enamel finish and provided with a key lock. Cabinets on each installation shall utilize one master key. Control wiring and system communications shall be electrically terminated inside the EMCS on a suitable termination board.

2.6 CONTROL UNITS

A. Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

B. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.

C. Stand-alone mode control functions operate regardless of network status. Functions include the following:

1. Global communications.
2. Discrete/digital, analog, and pulse I/O.
3. Monitoring, controlling, or addressing data points.
4. Software applications, scheduling, and alarm processing.
5. Testing and developing control algorithms without disrupting field hardware and controlled environment.

D. Standard Application Programs:

1. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.

2. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.

3. Programming Application Features: Include trend points; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.

4. Remote communications.

5. Maintenance management.

6. Units of Measure: Inch-pound and SI (metric).

E. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

F. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

2.7 LOCAL CONTROL UNITS

A. Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

B. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.

C. Stand-alone mode control functions operate regardless of network status. Functions include the following.

1. Global communications.
2. Discrete/digital, analog, and pulse I/O.
3. Monitoring, controlling, or addressing data points.

D. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

E. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

2.8 I/O INTERFACE

A. Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

B. Binary Inputs: Allow monitoring of on-off signals without external power.

C. Pulse Accumulation Inputs: Accept up to 10 pulses per second.

D. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.

E. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.

F. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.

G. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.

H. Universal I/Os: Provide software selectable binary or analog outputs.

2.9 POWER SUPPLIES

A. Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

B. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.
3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.10 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.

2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.

3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.

4. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

2.11 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Current Switches and Transducers:

1. Self-powered fixed setpoint digital output current switch to provide load status and power use trending data for small fixed loads only.

    a. Solid or split core slips over loose power wiring (solid core) or clips over installed power wiring (split core).
    b. Fixed on switch 0.25A max (solid core) or 0.15A (split core).
    c. Capacity to 200A (solid core) or 150A (split core).
    d. Digital switch output, rated 1A@30VAC/DC.
    e. LED status light.
    f. Operating conditions: -15 to 60 deg C, 0 to 95% rh.
    g. Polarity insensitive.
    h. 100% solid state.
    i. CE and UL listed.
    j. 5 year warranty.
    k. Similar to Veris Hawkeye 600 (split core) or 800 (solid core).

2. Self-powered adjustable setpoint digital output current switch to provide load status, loss of belt/load, and power use trending data for small potentially variable loads.

    a. Solid or split core slips over loose power wiring (solid core) or clips over installed power wiring (split core).
    b. Adjustable on switch 1.0A max (solid core) or 0.5A (split core).
    c. Capacity to 135A (solid core) or 175A (split core).
    d. Digital switch output, rated 1A@30VAC/DC.
    e. LED status light.
    f. Hysteresis 10% max.
    g. Operating conditions: -15 to 60 deg C, 0 to 95% rh.
    h. Polarity insensitive.
    i. 100% solid state.
    j. CE and UL listed, RoHS compliant.
    k. 5 year warranty.
    l. Similar to Veris Hawkeye Hx08 series.

3. Self powered analog current transducer to provide combination load monitoring, status, and power use trending data.

    a. Solid or split core slips over loose power wiring (solid core) or clips over installed power wiring (split core)
    b. Linear output from 0 to full scale.
    c. 0-5Vdc or 4-20mA analog output
    d. Operating conditions: -15-60 deg C, 0-95%rh.
    e. 2 second response time.
    f. Use solid core for new applications, split core for retrofits away from terminals.
    g. +/- 2% of reading accuracy from 10% to 100%.
    h. 100% solid state.

i. CE and UL listed, RoHS compliant.
j. 5 year warranty.
k. Similar to Hawkeye 722, 922/932, size and range as required for load.

4. Power Monitors:

a. 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

C. Temperature Sensors:

1. Temperature sensors shall be:

a. Platinum wound RTD Type $\pm$ 1°F. Factory calibration point - 70°F at 1000 OHMS or 0°C at 1000 OHMS. Adjustments for zero and span. Output 4-20 mA.

Or (for non averaging sensors)

b. Contractor may use thermistors which are compatible with system as follows:

1) Accurate to 0.35°F over a range of -40° to 240°F,
2) Noncalibrated devices, accuracy traceable to NBS testing,
3) Guaranteed stability of 0.2°F over a 15 year period,
4) Interchangable with any other in the new system, and
5) Shielded cable not require for the guaranteed performance.

2. Room element assemblies shall be located in conditions representative of the zone, on an interior wall where air is free to circulate around the element but away from non-representative air conditions such as drafts or heat radiation. Mount the assembly 5 feet above the floor on a standard electrical wallbox, or as otherwise directed or required to obtain satisfactory results. A mounting bracket, wallplate, decorative cover and tamper resistant screens shall be furnished with the assembly. May be S.S. wall plate type where applicable.

3. Outside air temperature sensing: The outside air sensor shall be mounted where the effects of sunlight and radiant heat are at a minimum (north wall) for true “dry-bulb” reading. Provide in enclosure to fit 1/2" threaded rigid conduit, designed for exterior dry-bulb sensing. Seal off fittings shall be used to prevent condensation on the element in the housing. Monitoring range to suit controls.

4. Duct temperature sensors: Duct insertion sensors for fan discharge and other thoroughly mixed applications designed for control and/or indication shall have a single sensor with an accuracy of 0.25% of scale range. Provide averaging type sensing elements for transmitters and capillary thermostats in mixed air and coil discharge applications to counteract effects of stratification. Length as required to provide at least four full passes across the duct – two long dimension and two diagonal. Capillary systems to be fully compensated. The element shall consist of nickel wire encased in a copper tube. Monitoring range to suit controls.

5. Liquid temperature sensors shall be mounted in separable brass immersion wells with 1/2" - 14 NPT threads, filled with "Insulgrease" or other approved heat transfer compound. Monitoring range to suit conditions. Well and spring loading device to assure RTD contact with end of sensing well. Whenever a sensing element and well are installed in a chilled water line, plumber's putty or some other suitable sealant shall be applied around the adapter as well as the point where the two sensors leads pass through the adapter. This is to prevent condensation of moisture in the well and failure of the element. Minimum well length to be equal to 1/2 of the pipe diameter; match bulb length to well length.

6. Battery powered “wireless communicating” sensors which use batteries as the source of power for transmission and communication of data are not acceptable.

D. Thermostats:

1. Electronic room thermostats shall be similar to room temperature sensors with occupancy over-ride, bias adjustment, and LCD space / setpoint temperature readout functions built in.

2. Provide with durable cast aluminum or polycarbonate guard where required to prevent unauthorized access.

3. Battery powered “wireless communicating” thermostats which use batteries as the source of power for transmission and communication of data are not acceptable.

4. Incidental electric thermostats specifically indicated as not connected to EMCS shall be heavy duty type with concealed adjustment.

2.12 HVAC PROCESS FLOW CONTROL COMPONENTS

A. Automatic Air Dampers (AAD on drawings):

1. Provide all automatic dampers except those specified as being furnished by equipment manufacturer. Thermally Insulated Automatic dampers are required at all exterior wall and roof openings serving a HVAC purpose which are provided or modified as a part of this project, whether or not called for on the drawings. Control dampers to operate with sequence described later or as directed.

2. Where damper is separating outside air from the conditioned space with no intervening air handler, for example relief air and exhaust fan dampers with short connected duct runs only, and additionally where called for on the drawings with the designation “AAD,” provide automatic dampers of thermally broken insulated construction design as described herein**.**

3. Size dampers at full duct or damper size indicated on the drawings, arranged for flanged to duct rather than inserted in duct installation (clear damper opening, not outside of frame, equal to duct size indicated). If neither duct or damper size is indicated; size for maximum velocity of 1500 fpm and maximum pressure drop including transitions to and from duct 0.05 in w.g.

4. Materials:

    a. General-service dampers not covered by the below restrictions, in galvanized steel ductwork, may be of galvanized steel construction.
    b. Dampers in aluminum ductwork: aluminum or stainless steel.
    c. Dampers subject to corrosive fumes: stainless steel of a type resistant to the fumes.

5. Overall Construction:

    a. Damper frames fabricated of extruded aluminum sections or formed steel, with reinforced corner bracing, suitable for flange mounting to duct. Seal any and all gaps at frame joints to maintain airtight integrity of ductwork.

        1) Where flanged to duct mounting is not possible due to space restrictions or where Owner prefers access from inside duct, propose slip in style dampers on a case by case basis in damper submittal along with individual rationale for frame style selection.

    b. Provide extruded aluminum airfoil construction for dampers modulating outside and return airflow, isolating lead/lag blowers, those operating on systems with over 2" water column potential close off pressure, and those operating over 1500 fpm.

    c. Fasten aluminum frames with approved stainless steel fasteners, separated from dissimilar metal casing by dielectric gasketing.

    d. Damper blades not more than 8" in width.

    e. Mount blades on electroplated square or hexagonal steel shafting operating in stainless steel, bronze, or approved polymer sleeve bearings.

    f. Provide corrosion resistant linkage and actuator mounting compatible with the damper materials and service, concealed in the frame outside of the airstream for flanged to duct applications and mounted in the airstream for slip in construction.

    g. Provide parallel blade operation for all two position dampers, and opposed blade operation for modulating dampers, with exception of face and bypass dampers which shall be made up of two sections of parallel blade dampers with the blades of one damper opposed to the blades of the other for proper mixing.

    h. Dampers over 48 in. in length and height shall be made into multiple sections.

    i. Dampers shall be capable of sequencing as required.

    j. Provide AMCA Standard 511 certified class 1A leakage dampers, with maximum leakage not exceeding 3 cfm per square foot at 1 inch water gage pressure differential, or 8 cfm per square foot at 4 inches water gage pressure differential when held in the closed position with a torque of no more than 6 inch pounds per sq. ft.

    k. Temperature range shall be suitable for the intended service.

6. Galvanized Formed Blade Construction Dampers:

    a. Frame of 16 gauge galvanized hat shaped channel.
    b. Blades of single thickness 16 gauge interlocking formed galvanized steel.
    c. Neoprene blade seals, and neoprene or compressible spring steel jamb seals.
    d. Design make: Arrow Series 395.

7. Extruded Aluminum Airfoil Construction Dampers:

    a. Frames and airfoil blades of extruded aluminum construction.
    b. Extruded polymer dampers seals with airstream inflatable double edges, mechanically locked in extruded blade slots, and easily field replaceable.
    c. Blades jamb seals compressible spring stainless steel.
    d. Design make: Ruskin Model CD-50 or equal.

8. Thermally Broken Design Dampers shall be of similar construction to Extruded Aluminum Airfoil Construction Dampers above, with the following modifications:

    a. Thermally broken frame with minimum three part extrusions separated by two structural urethane resin pockets.
    b. Blades constructed of two part airfoil aluminum extrusions thermally isolated by insulation, with blade cores filled with expanded urethane insulation.
    c. Dampers blade and jamb seals of extruded silicone and compressible spring stainless steel with leakage AMCA rated to -40 deg. F.
    d. Twin damper blade seals, one on either side of the thermal break, enclosing an insulating airgap.
    e. AMCA rated for energy efficiency with a minimum AMCA 500D Thermal Efficiency Ratio of 900%, and an assembly R value of 2 minimum.
    f. Design make: Tamco series 9000 BF, Ruskin Model TED50BF, Greenheck ICD45, or equal, all with options as required to meet specification.

B. Valves:

1. Valve Types:

    a. Ball valves – full port for two position on/off service, with characterizing disc for modulating service.
    b. Globe valves - modulating service.

2. Valve Bodies:

    a. Screwed bronze bodies (2" size and smaller).

    b. Ball valves shall be of two piece full port stainless steel ball and stem design similar to those described in SECTION 23 05 23 “General Duty Valves for HVAC Piping” but with reinforced actuator duty stems, adapters, and electronic actuators.

    c. Globe valves shall have characteristic type throttling plug, #316 stainless steel or Monel stem, and removable composition seats, tight closing to class 4 standard minimum. Provided with necessary features to operate in sequence with other valves or damper operators and adjustable throttling range.

d. Two or three way as required.

e. Designed for 125 psi operating pressure.

f. Arrange to spring return to fail-safe position as called for, quiet operating.

3. Two position valves to be full line size unless otherwise indicated. Modulating water control valves shall be sized on the basis of the smaller of 15% of the total system pressure drop or 8 ft. of water column pressure drop, based on the system design flowrates. Include valve pressure drops in submittal for review. Tag each valve before delivery to project site with scheduled valve identification for location and service.

4. Provide valves and actuation so valves fail safe in normally open or closed positions as required to provide freeze, humidity, force, temperature, etc. protection. Fail position choice shall be submitted for review.

5. Select two-way modulating valves to have equal percentage characteristics.

C. Actuators:

1. Electronic actuators:

a. Electronic actuators shall be motor driven with cast aluminum enclosure, with completely oil-immersed metal gear trains, sealed integral spiral spring return mechanism, force sensor safety stop, and shall have torque as needed to insure positive movement against system stall pressure. Furnish entire mechanism in housings designed for easy removal for service or adjustment.

b. Size each actuator motor to operate with sufficient reserve power to provide smooth modulating or 2-position action as specified.

c. Provide permanent split-capacitor, shaded pole, or synchronous motors with gear trains completely oil-immersed and sealed.

d. Equip motors for outdoor locations and for outside air intakes with "0 ring" gaskets designed to make motors completely weatherproof, and equip with internal heaters to permit normal operation at -40 deg F (-40 deg C).

e. All actuators for exterior use shall be electronic style and shall have NEMA 4 enclosures with a rain shield covering the valve stem and entire actuator housing.

f. Damper actuators shall be direct-coupled over the damper shaft, and shall be installed without connecting linkage where possible.

1) Where linkages are required, for example with multiple section dampers or dampers where actuator must be installed in the air-stream, provide with linkage furnished by the damper manufacturer and designed for the actuator being used.

g. Ball valve actuators shall be direct-coupled over the valve shaft, installed without connecting linkage.

h. The actuator shall have electronic overload and digital rotation sensing to prevent damage to the actuator through the entire rotation range of the actuator.

i. Actuators shall be capable of both clockwise and counter clockwise motion by changing mounting orientation.

j. Provide proportional actuators for modulating services that accept a 0 to 10 VDC or 4 to 20mA control input and provide a 2 to 10 VDC or a 4 to 20mA operating range. An actuator capable of accepting a pulse width modulated / floating point control signal and providing full proportional operation is only acceptable for hydronic valve services where there is no connection to outside air.

k. All 24 VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 watts for DC applications. Actuators operating on 120VAC power shall not require more than 10VA. Actuators operating on 230VAC power shall not require more than 11VA.

l. All actuators shall have an external manual gear release and actuators with more than 60 in-lb torque capacity shall have a manual crank to allow manual positioning when the actuator is not powered.

m. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation.

n. Actuators shall be provided with a conduit fitting and minimum three foot electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

o. Actuators shall be UL Standard 873 listed and CSA Class 4813 02 certified as meeting correct safety requirements.

p. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuators rated torque and shall have a minimum 2-year manufacturer's warranty, starting from the date of installation.

q. Design make: TAC-I/A *DuraDrive* series and Belimo models as required by torque.

2.13 SAFETY DEVICES

A. Low Limit: Electric type with 20' long serpentine element, coldest foot sensitivity, with automatic reset and auxiliary contacts to the EMCS. Set for 37 deg. F for "freeze" protection and 55°F for fan discharge application.

B. Surge Suppression (Sp) Receptacle:

1. Surge suppression receptacle with metal oxide varister to dissipate the electrical energy of voltage spikes.
2. 20 ampere, duplex, NEMA 5-20R configuration.
3. Back and side wiring, high impact nylon body.
4. May be integral to panels.

2.14 MISCELLANEOUS DEVICES

A. Provide all necessary relays, controllers, accumulators, positioners, switches, solenoids, transformers, temperature sensors, and transducers for a complete system.

1. Locate these devices on local panel or enclosure adjacent to controlled equipment as required by codes and so as to facilitate service and maintenance, unless specified otherwise.

B. Relays:

1. Cube Type and Panel Mounted Relays:

a. SPDT or DPDT as required by application.
b. Cube type enclosure designed to mount on exterior of adjacent junction enclosure.
c. Track mount designed to mount on interior of panel or equipment adjacent junction enclosure.
d. Contact ratings: 10A resistive @ 120 - 277Vac, 1/3HP NO 120-240Vac, 10 million cycles minimum.
e. 10-30 Vac/dc to120 or 208/277 Vac coil as required.
f. LED status light.
g. Operating time 20mS max.
h. Operating conditions: -15 to 60 deg C, 0 to 95% rh.
i. CE and UL listed for plenum installation, RoHS compliant.
j. 5 year warranty.
k. Similar to Functional Devices, Inc., RIBU / RIBH series (cube type) and RIBMU series (track mount).

2. Combination Status Sensor / Relay / HOA Motor Control Devices:

a. SPDT or DPDT as required by application.
b. Enclosure designed to mount on exterior of adjacent junction enclosure.
c. Contact ratings: 1HP NO/NC 120Vac, 10 million cycles minimum.
d. Operating time 20mS max.
e. Integral HOA switch.
f. 10-30 Vac/dc to120 or 208/277 Vac coil as required.
g. Adjustable current sensing on switch 0.5A to 20A.
h. Current sensor capacity to 20A.
i. Digital switch output, rated 1A@30VAC/DC.
j. LED status light.
k. Hysteresis 10% max.
l. Operating conditions: -15 to 60 deg C, 0 to 95% rh.
m. CE and UL listed for plenum installation, RoHS compliant.
n. 5 year warranty.
o. Similar to Veris Hawkeye H548.

C. Wiring:

1. Controls power wiring: Provide wiring in accordance with requirements of Section 23 05 13, Division 26, and the National Electrical Code.

2. Controls communications and data cabling:

a. Provide plenum rated cables, in full accordance with the requirements of Divisions 26 (Electrical) and 27 (Communication).

b. Provide cabling as recommended in writing by the controls manufacturer for optimized communications, similar to:

1) 22AWG single twisted pair, low capacitance (12.5pF/ft), shielded or unshielded plenum rated cable for low voltage communications.
2) 18AWG single twisted pair, low resistance (6mW/ft), shielded plenum rated cable.

3. Controls communications and data fiber optic cabling: Provide in accordance with the stricter of the requirements of Divisions 26, 27, and the written recommendations of the manufacturer of the equipment served.

4. Where additional wire to wire terminations are required beyond end device and controller termination strips, make connections using NEMA rated termination blocks with barrier isolated strip/screw or tube/screw connections, all labeled for current function. Flying splices not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which materials and methods are to be installed and notify Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in acceptable manner.

1. Installation indicates conditions are acceptable to Contractor as required to ensure requirements for applicable warranty or guarantee can be satisfied.

2. Electrical Wiring: Check all electrical wiring associated with equipment for compliance with specifications and correctness of connections. Correct wiring in event equipment or devices fail to function in specified manner, whether due to incorrect connections or improper information and wiring diagrams.

3. Verify that conditioned power supply is available to control units and operator workstation as required.

3.2 WORK INCLUDED

A. Provide all labor, materials, equipment, and services required for the complete removal of all existing controls components being replaced or upgraded as a part of this project or which serve equipment being removed as a part of this contract.

1. Insure that controls for areas outside of this contract's work remain intact and functional. Report any existing problems with functionality before demolition. New problem areas not otherwise a part of this scope that result from this demolition work: rebuild original functionality or upgrade to be included in the new controls.

B. Provide all labor, materials, equipment, and services required for the complete EMCS installation, including Related Work, as required in the Contract Documents. Provide all programming labor required for creating the specified sequences of operation and associated graphics. Include labor required for integrating any software and programming enhancements made both during construction and commissioning and during the warrantee period. Include labor for any programming modifications required due to special circumstances not adequately described in the written sequences of operations, as required to control systems operation as intended.

C. Provide all controls wiring required to connect devices furnished as part of or adjunctive to this EMCS regardless of the source of supply. Provide connections to Owner's LAN, WAN, telephone, and internet as required to perform controls work. Coordinate all fiber optic, telecommunications, and other electrical connections with Owner.

D. Provide power wiring for controls requiring connection to AC power. Control circuits to be 120 vac maximum. Install wiring in accordance with requirements of SECTION 23 05 13 "Common Electrical Requirements for HVAC Equipment", Division 26, and the National Electrical Code. Provide actuator power wiring to all automatic dampers including fire/smoke dampers.

E. Provide all necessary devices required for proper system operation, including special electrical switches, conditioned power supplies, transformers, disconnect switches, relays, circuit breaker protection, as required.

F. Provide all controllers, actuators, sensors, etc. as specified later herein, and as required to meet the specified sequence of operation.

G. Furnish all valves, control wells, and dampers to Contractor responsible for their installation, as specified and as required to meet the sequence of operation.

H. Provide interface connections from EMCS hardware to equipment starting circuits, alarms, etc.

I. The system shall include all accessory equipment and electrical wiring to fulfill the intent of this specification, including all control and communications components required to interface with the Owner's Ethernet LAN, forming a complete and interoperable system.

J. Each portion of the District EMCS system as described above shall include all gateways, translators, interpreters, software, programming, or other accessory devices as required to achieve BACnet communications over the LAN.

3.3 INSTALLATION

A. System shall be installed and adjusted by trained mechanics and technicians, with a demonstrated experience of not less than (5) years, in the installation, adjustment, and repair of temperature control systems.

B. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

C. Connect and configure equipment and software to achieve sequence of operation specified.

D. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Components."

E. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."

F. Install refrigerant instrument wells, valves, and other accessories according to Division 23 Section "Refrigerant Piping."

3.4 SYSTEM COMPONENTS

A. Current Switches and Transducers: As required; install per manufacturer's written instructions.

1. Fixed setpoint digital output current switch: use only on fixed direct drive loads with no variability, under 0.5Kw, including small constant speed direct drive fans and pumps, and similar equipment.

2. Adjustable setpoint digital output current switch: use only on fixed but potentially variable loads including belt driven or coupled loads and similar conditions, under 0.5Kw. Adjust to sense broken belt or coupling or other loss of primary load while motor continues to run.

3. Analog Current Transducers: use on variable current / variable power loads and all loads above 0.5Kw including ECM fans, larger fans and pumps, and similar equipment.

    a. Where Variable Frequency Motor Controllers are used, monitor current / power and status through VFMC equipment interface to controls system.

4. Power Monitors: use on three phase loads without other comparable power use monitoring. Size and use for whole building loads as specified for Electrical Demand Monitoring and Control if integration to utility meter for comparable data is not available.

B. Temperature Sensors: Install per manufacturer's written instructions, in locations representative of the controlled spaces' temperature as required for proper control. Include proposed sensor locations in wiring diagram submittal.

1. Provide room temperature sensors for all spaces where thermostats are not specifically called for, as required to properly and individually control all building mechanical HVAC and domestic hot water equipment in accordance with the sequence of operation. For large spaces, provide at least one room sensor per 2000 square feet, in locations representative of the room's various exposures and internal loads.

2. Temperature Sensor with Guard: Provide sensor with guard (preferably S.S. wall plate sensor) wherever temperature sensor is called for in publicly accessed spaces similar to corridors, vestibules, lobbies, stairwells, cafeteria, gymnasium, auditorium, etc.

3. Duct and pipe temperature sensors: Provide as shown on the controls schematics and as required to properly control per the written sequence of operations.

4. Outdoor air sensors: Provide as required to accurately sense outdoor air conditions for proper economizer control, at least five separate locations facing each of East, West, North, and South, as well as a representative rooftop location.

C. Thermostats: Locate thermostats on walls symmetrical with adjacent items. Verify exact room location to avoid doors, fixed and portable equipment. Install to minimize damage. Do not install adjacent to lighting dimmers or other heat generating equipment. Include proposed thermostat locations in wiring diagram submittal.

1. Provide thermostats as specified and as required to properly and individually control all building mechanical HVAC equipment for all administrative offices, staff work and break rooms, classrooms, small group instruction rooms, large group instruction rooms, mechanical rooms, and spaces similar to these in function. Specifically, not included in this list are corridors, vestibules, lobbies, stairwells, utility closets, and storage rooms.

2. Thermostat Guards: For bidding purposes, assume 10% of thermostats listed in 3.4.E.1 above will require guards – coordinate locations with Owner and Engineer during submittals. In addition to these and the multiple room sensors required by 3.4.D.1 above, provide single thermostat with protective guard for media center, cafeteria, gymnasium, and auditorium.

D. Automatic Dampers: Furnish dampers, tagged for proper location, (with multiple section damper linkages). Install per manufacturer's printed instructions. Adjust to close tightly. Allow for conduit sleeve or blank space for roof fan dampers.

E. Valves: Install with union or flanged connection. Locate close to apparatus controlled with pipe reducers and increasers located adjacent to valve. Locate, arrange, and pipe per installation diagram in an upright position (stem vertical).

F. Actuators: Install per manufacturer's printed instructions as to motor size and quantity, linkage arrangement, drive connection point. Where ducts or valves are insulated, set damper operators at least 2 in. away from equipment to allow for insulation.

G. Safety Devices:

1. Manual Reset Low Limit: Install on all equipment handling both water and any percentage of unheated outside air, including equipment in boiler rooms handling combustion air, serpentined on the discharge face of heating and/or cooling coils, or elsewhere as required for proper freeze protection, set at 37 deg F. Low limit trip shall report an alarm to the EMCS, which shall prevent the unit's fans from operating (not applicable to boiler burner fans), cause full flow of water in elements being protected, and fully close the outside air intake and exhaust air dampers until automatically reset (combustion air dampers shall not be closed when combustion is required for building heating). If some other sequence is required for proper freeze protection of special equipment or circumstances, provide this and detail in submittal.

H. Miscellaneous Devices: As required; install per manufacturer's written instructions.

3.5 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable according to the following:

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.6 SYSTEM SOFTWARE

A. Provide completely installed and ready for use.

B. System Configuration and Definition:

1. All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.

2. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently add, delete, or modify the following:

   a. SCUs.
   b. OWSs.
   c. UCs.
   d. Points of any type, and all associated point parameters and using constants.
   e. Alarm reporting definition for each point.
   f. Control loops.
   g. Energy management applications.
   h. Time and calendar based programming.
   i. Totalization for every point.
   j. Historical data trending for every point.
   k. Custom control processes.
   l. All graphic displays, symbols, and cross references to point data.
   m. Dial-up telecommunication definition.
   n. All operator passwords.
   o. Alarm messages.

3. System Definition/control Sequence Documentation: All portions of system definition shall be self documenting to provide hard copy printouts of all configuration and application data. Control process and EMCS control loop documentation shall be provided in logical, graphical flow diagram format to allow control sequence to be easily interpreted and modified at any time in the future.

4. Database Save/Restore/Back-Up: Back-up copies of all standalone EMCS panel databases shall be stored in at least one personal computer operator workstation, and a secure electronic copy of the original complete database setup shall be stored at the offices of the TCS, available for the Owner's use.

5. Continuous supervision of the integrity of all EMCS panel databases shall be provided. In the event that any EMCS panel on the network experiences a loss of its databases for any reason, the system shall automatically download a new copy of the respective database to restore proper operations. Database back-up/download shall occur over the local area network without operator intervention. Users shall also have the ability to manually execute downloads of any or all portions of an EMCS panel database.

3.7 SCU PANEL LOCAL OR PORTABLE OPERATOR'S TERMINALS

A. Each EMCS panel shall be capable of supporting an operator's terminal for local command entry, instantaneous and historical data display, and program additions and modifications.

1. There shall be a provision for both permanently mounting the standalone EMCS panel operator terminal, or using it as a portable hand held unit.

2. The EMCS panel operator terminal shall simultaneously display a minimum of 6 points with full English identification to allow an operator to view single screen dynamic displays depicting entire mechanical systems.

3. The operator functions provided by the EMCS panel operator terminal shall include, but not be limited to, the following:

   a. Start and stop points
   b. Modify setpoints
   c. Modify PID loop setpoints
   d. Override PID control
   e. Change time/date
   f. Add/modify start/stop weekly scheduling
   g. Add/modify setpoint weekly scheduling
   h. Enter temporary override schedules
   i. Define holiday schedules
   j. View analog limits
   k. Enter/modify analog warning limits
   l. Enter/modify analog alarm limits
   m. Enter/modify analog differentials
   n. Viewpoint history files

4. The EMCS panel operator terminal shall provide access to all real or calculated points in the controller to which it is connected, or any other controller in the network. This capability shall not be restricted to a subset of predefined "global points" but shall provide totally open exchange of data between the operator terminal and any EMCS panel in the network.

5. Operator access at all EMCS panel operator terminals shall be identical to each other, as well as identical to the PC or Laptop operator workstations. Any password changes shall automatically be downloaded to all controllers on the network.

6. The EMCS operator terminal shall provide English language prompting to eliminate the need for the user to remember command formats of point named. Prompting shall be provided consistent with a user's password clearance and the types of points being displayed, to eliminate the possibility of operator error.

7. A multifunction touch pad shall be provided for point and command selection, as well as parameter entry. To minimize the possibility of operator error, the EMCS panel operator terminal shall change the limit touch pad functions based upon an operator's password clearance, the function being performed, and types of points being displayed. Screen displays shall clearly indicate only valid touch pad functions.

8. Context Sensitive Help: On-line, interactive user's "Help" manuals and tutorials shall be provided. Based upon operator request, the "Help" function shall provide general system operating instructions and specific descriptions of commands available in the currently displayed menus.

9. Identification for all real or calculated points shall be consistent for all network devices. The same English language names used at PC workstations shall be used to access points at the EMCS panel operator's terminal to eliminate cross reference or look up tables.

10. In addition to instantaneous summaries, the EMCS panel operator's terminal shall allow a user to view a point history file for system points. Point history files shall provide a record of value of analog points over the last 24 hours, at 30 minute intervals, or a record of the last ten status changes for binary type points.

3.8 GENERAL CONTROLS SYSTEM PROGRAMMING DESCRIPTION

A. Provide color graphic floor plan displays and system schematics detailing all mechanical and electrical systems as indicated in the sequence of operations, at least one for each system and piece of mechanical equipment, including air handling systems, chilled water systems, and heating systems. Create displays to represent logical grouping of system points or calculated data based upon building function, and mechanical system points which aid the operator in the analysis of the facility. The operator shall be able to view and control these systems via graphical and text-based displays and controls.

1. Provide access to the various system schematic and floor plan graphics via any and all of mouse driven graphical penetration scheme, menu selection, “file tree” organization, or text based commands.

a. Graphical menu penetration: locate and display systems graphics via a mouse driven procedure, designed and implemented to optimize performance analysis and speed alarm recognition. Five clicks maximum from whole district map to details of critical alarm via this route.

1) Whole District Map: Include each building shown as an active link; point and click to go to building. Display any building with (Owner defined, TCS implemented) alarms present as highlighted for rapid system review and diagnosis. Include at least three levels of alarm to facilitate prioritizing; each level shall be obvious and visually distinct. The most critical alarm in any building shall define the alarm level of that entire building in this graphic.

2) Main Building Display: Include a full floor key plan of each floor, broken into areas of detailed floor plans, with similar active point/click penetration scheme and highlighted alarm areas.

3) Detailed Floor Plans: Indicate the location of mechanical equipment (boilers, chiller, air handlers, duct and reheat / VAV systems, pumps and pumping systems, metering equip. etc.) and electrical equipment (switch gear, lighting, etc.) on the detailed floor plans. Highlight any systems when in alarm. Outline limits of each control zone (typically along walls, etc..) and provide active multicolored background for each zone. Zone background color shall change with space temperature deviation from setpoint, with a minimum of 8 background colors, colors to be distinct from alarm highlight colors.

4) System Specific Graphics: Provide pictorial schematically correct representations of each and every mechanical system controlled and/or monitored. Include all associated points, digital status, analog values, appropriate and/or significant calculated values, alarms, active adjustment of all user adjustable setpoints, links to all scheduling, trend logs, sequence of operations description, associated systems schematics in appropriate locations, etc. Include plain English descriptions of each active point / link shown. Include appropriate plain English warnings for alarms. Modify as required by Owner and Engineer during system review, start-up, and commissioning.

b. Menu and text based penetration: An operator request for information about a specific system shall cause the associated graphic display to be automatically selected and output on the viewing screen. The operator request may be entered via either the graphical menu penetration procedure or via a pull down directory tree style menu system with “specific building,” “specific mechanical room,” and “specific system” levels of identification. The pull down menu system shall cause the graphical menu system to be updated.

B. Graphic Representations

1. General: The program shall allow the operator to generate color graphics on-line using standard symbols selected from a standard library of symbols.

2. Provide customized graphics with dynamic point values and set points. Graphics shall include but not be limited to:

a. Each third party microprocessor controlled system with all points available.

b. Heating Hot Water System with heat injection systems, primary hot water system, secondary hot water systems, 3-ways, 2-ways, etc.

c. Air Handling Units, air and water sides, with coil pumps, zones, etc.

d. Floor Plans - The operator interface shall allow the user to access the various graphical schematics via a graphical penetration scheme of the floor plans. Minimum breakdown shall include:

1) Whole District map, showing all buildings.
2) Key plan of each building.
3) Floor plans of each building with zoom in capability.

C. Time Schedule Programs

1. The programs for the EMS shall schedule each system's operation on an hourly basis controlled through daily, weekly and/or monthly schedules. Schedules for each individual system, room or area shall be programmed and modified by the user on a calendar-like display at the OWS.

2. The programs shall store 60 months of schedules.

3. An internal time clock shall automatically compensate for daylight savings time and calendars generated by software shall automatically compensate for leap years.

D. Trend Logs:

1. Provide customized trend log reports with up to twenty variables per report for each HVAC system. Points shall be assignable at the OWS; coordinate desired points on each log with Owner during training and commissioning. Archive trended values on the system hard disk for future inquiry, with back up copies automatically prompted for and generated on removable media.

E. Alarm Points

1. Alarm all temperature inputs to the DDC system (space, return air, mixed air, discharge air, supply and return water, boiler and cooling systems) at the OWS if the temperature is out of range 10 deg. F (adj.) above or below setpoint.

2. Monitor fan status with current sensing devices or differential pressure switch. If the fan is scheduled to run and the status is not proven, generate an alarm condition shown at the OWS.

3. Monitor pump status with current sensing devices. If the pump is scheduled to run and the status is not proven, generate an alarm condition at the OWS.

4. Monitor all alarm points of any stand alone controllers such as boiler burner controls, chiller or condensing unit controls, etc.., and generate an appropriately annunciated alarm condition at the OWS.

5. For all alarms, provide appropriate text and graphical annunciation to facilitate ease of understanding of source and location of problem. Coordinate annunciation with Engineer, equipment manufacturers, and Owner’s representatives.

F. Optimum Start and Stop Program

1. Bring the building from unoccupied control mode through a warmup / cooldown mode into occupied mode through a controlled optimum start program. Gradually change space temperature requirements from unoccupied to occupied setpoints over a predetermined time to not only bring the building to required temperature but also soft start building mechanical equipment.

2. Include warm-up/cool-down mode between unoccupied and occupied periods such that the temperature reaches occupied setpoint before occupied ventilation begins.

3. Each system shall have an independent modular program.

4. Minimize the total energy consumption during daily start-up and shut-down of each heating/cooling system via optimized timing and adjustment.

5. Compare the outside air temperature to space temperature, required setpoints, and historical startup and shut-down data to calculate optimized start and stop times for each system.

6. Adjust the timing for each system to bring its respective zone to occupied setpoint at the time of occupied mode start and to shut-down its respective zone as early as possible without letting the temperature drift out of the specified comfort range.

7. The optimum start / stop program shall be adjustable to the rate structure of the local energy company.

8. Incorporate an enhanced ventilation mode in the Optimum Start Program

G. Fire/Fan Shut Down

1. When fire alarm condition is initiated, the fire alarm system shall directly cause all fans 1000 cfm and larger to shut down and shall provide a signal to the EMCS to note fire alarm condition.

2. When fire alarm condition signal is received from the fire alarm system, initiate the following sequence:

a. Cause all building fans 1000 cfm and larger to shut down. This is in addition to the direct shutdown caused by the fire alarm system.

1) Allow variable speed drives to ramp down and ramp up on restart.

b. Do not permit unrelated HVAC equipment (heating valves, pumps, etc..) in building to lose control.

c. Upon termination of the fire alarm condition as indicated by a signal from the fire alarm system, cause all automatic fire/smoke dampers to open and prove open, then return all affected fans to their normally scheduled operation using the demand limiting staggered start algorithm.

H. Day/night Setback

1. The day/night setback will consist of lowering the space heating setpoint and raising the space cooling setpoint during the unoccupied mode, thereby reducing the heating and cooling energy requirements. The occupied and unoccupied areas will be specified by the owner and will be coordinated with the control system.

I. Maintenance Management: Continuously totalize run hours for equipment controlled and/or monitored for use by the maintenance management program.

J. Equipment Scheduling

1. Equipment shall be capable of 7 days, 24 hours schedules with separate holiday hours.
2. There shall be capability for five different holiday schedules which can be selected from the occupancy schedule graphic.
3. Holidays shall be programmed so that they shall need a minimum of manual adjustment year to year and can easily be modified at front end if necessary.
4. All schedule programming shall reside in local controllers but shall be configurable from the front end.

K. Coil Freeze Protection.

1. Heating coils and any other equipment provided as a part of this project which are circulating water (not required for glycol coils) or are otherwise subject to water freeze damage, subject to the following, that have any percentage of unheated outside air entering them, shall have coil freeze protection.

2. Mixed outside and return air and the preconditioned discharge air from air to air energy recovery units shall be considered unheated for this purpose.

3. The first stage of coil freeze protection shall incorporate analog input temperature sensing at the expected freeze location. Sensing devices may be immersion style return water temperature sensor piped as close as practical to the outlet of the coil (within the rooftop unit if applicable), surface temperature sensors on the coil surface at the expected freeze location, or other comparable devices approved as applicable to the circumstances. Include details of freeze protection scheme for all such equipment in submittal. When the sensed temperature is above 60ºF (adj.), the coil control valve shall be under space temperature control. If at any time the expected freeze location sensed temperature drops below 60ºF (adj.), the control valve shall temporarily open to raise that coil's return water temperature to above 80ºF (adj.), and the EMCS shall report an alarm to the OWS.

4. The second stage of coil freeze protection shall be the low limit freeze stat air temperature sensors with the sequence defined under safety, above.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safety.
3. Test each point through its full operating range to verify that safety and operating control set points are as required.
4. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.

5. Test each system for compliance with sequence of operation.
6. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.

2. Check instruments for proper location and accessibility.

3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.

4. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.

5. Check temperature instruments and material and length of sensing elements.

6. Check control valves. Verify that they are in correct direction.

7. Check DDC system as follows:

a. Verify that DDC controller power supply is from emergency power supply, if applicable.
b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
c. Verify that spare I/O capacity has been provided.
d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.10 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.

2. Make three-point calibration test for both linearity and accuracy for each analog instrument.

3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.

4. Control System Inputs and Outputs:

a. Check analog inputs at 0, 50, and 100 percent of span.
b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
c. Check digital inputs using jumper wire.
d. Check digital outputs using ohmmeter to test for contact making or breaking.
e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Temperature:

   a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
   b. Calibrate temperature switches to make or break contacts.

6. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

7. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.

8. Provide diagnostic and test instruments for calibration and adjustment of system.

9. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

3.11 SYSTEM TESTING AND COMMISSIONING

A. Test complete control system for control device operation prior to the systems acceptance. Demonstrate complete sequence of operations to Architect’s and Owner’s representatives.

1. Verify operation of system inputs and outputs, control loops and/or software programming, timing functions, operator entered constants, facilities management functions, etc., and observe that they perform their intended functions. Generate check out data sheets for each system so verified.

2. Field verify analog input calibration, analog output operation, digital input function, digital output operation, and coordination of system inputs and outputs between system graphics and field devices for schematic accuracy. Coordinate device testing with Testing and Balancing Agency – refer to section 23 05 93 “Testing, Adjusting, and Balancing for HVAC” for additional information. Generate check list of all devices, keyed with descriptive locations and functions, along with complete calibration, testing, and coordination data, certified by Contractor and TAB agency.

3. Provide complete values and points logs, printed with hourly values for one week, demonstrating correct control functions and programming.

B. When above procedure has been completed and control systems are operating satisfactorily, produce and submit a report of entire systems performance for review, including all data described above. Submit three copies to the Architect's Representative advising them that the control system is 100% complete and operates in accordance with the Contract Documents.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 09 00

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, special-duty hydronic systems fittings, equipment, valves, and specialties, and joining methods for the following:

1. Hydronic Systems piping.
2. Air conditioning condensate drain piping.
3. Air-vent piping.

1.3 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Copper Hydronic Piping: 125psig at 250 deg F.
2. PVC Hydronic Piping: 90psig at 110 deg F.
3. CPVC Hydronic Piping: 90psig at 140 deg F.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Above Grade Piping
2. Pipe Fittings.
3. Dielectric Fittings.
4. Specialty Valves.
5. Pressure Control
6. Special Duty Hydronic Components.

B. Shop Drawings: Include in coordination drawings details of the piping layout showing proposed piping routing including locations of offsets, fittings, elevations with drain and vent fittings, pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Provide enlarged details of congested areas, custom anchor fabrication, and other details as required to clearly delineate the proposed construction.

1.5 CLOSEOUT SUBMITTALS

A. Field quality-control test reports.
B. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with all applicable sections of the following:

1. ANSI / ASME B 31.9: "Building Services Piping".
2. ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
3. New York State Labor Department Industrial Code Rule No. 4 (cited as 12 NYCRR4)
4. New York State Labor Department Industrial Code Rule No. 14 (cited as 12 NYCRR14).
5. Building Code of New York State.
6. ANSI / ASHRAE 15 “Standard Safety Code for Mechanical Refrigeration”.
7. ASME label on all pressure vessels and safety valves.
8. ANSI / ASME B31 – “Code for Pressure Piping”.

B. Installer Qualifications:

C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Refer to Part 3 for Piping Applications Article.

B. 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:

1. Anvil International, Inc.
2. Cerro Flow Products, Inc.
3. Mueller Industries, Inc.
4. S. P. Fittings; a division of Star Pipe Products.
5. Viega LLC
6. Victaulic Company of America.

C. Copper Tubing: ASTM B 88, Annealed or Drawn Temper, Types M, L, and K.

D. Copper Tube Fittings:

1. Solder Fittings

a. Tees, Elbows, Reducers, Adapters: ANSI B16.22 streamlined pattern wrought copper or ANSI B16.18 cast bronze; solder end connections; ASTM B62.
b. Unions: Solder type, cast bronze, ground joint, Class 150.
c. Cast Bronze Flanges: ANSI B16.24 Class 150 solder connection flanges, raised ground face, ANSI pattern drilled and spot faced bolt holes.

2. Pressure-Seal Fittings:

a. Housing: Copper conforming to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.
b. Sealing elements: EPDM, factory installed by fitting manufacturer.
c. Leakage path designed into un-pressed fittings assuring readily visible leakage of system liquids past the sealing element of any un-pressed connection.
d. Tools: Manufacturer's special tools that compress fittings and effect pressure seal.
e. Minimum 200-psig working-pressure rating at 250 deg F."

2.2 PLASTIC PIPE AND FITTINGS

A. CPVC Plastic Pipe: ASTM F 441/F 441M, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.
B. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.
C. PVC Plastic Pipe: ASTM D 1785, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.
D. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2665 for DWV fittings, ASTM D 2466 for Schedule 40 pipe fittings; ASTM D 2467 for Schedule 80 pipe fittings.

2.3 JOINING MATERIALS

A. Solder Filler Metals: Use solder conforming to ASTM B 32-95; alloy grades Sn96, Sn95, Sn94, E, AM, WS; lead free alloys with maximum lead content of 0.1percent by weight, minimum solidus temperature of 430 deg. F, and approved for use with potable water. Higher lead content solder not acceptable. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: Select brazing filler metals compatible with piping to be joined:

1. AWS A5.8 BCuP Series, copper-phosphorus alloys for joining copper with copper only.

2. AWS A5.8 BAg series, cadmium free silver bearing alloys for joining dis-similar metals including copper with any brass, bronze, steel, or stainless steels, or other dis-similar brazeable materials.

C. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.

a. Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), in contrasting color.

2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), in contrasting color.

2.4 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:

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. Charlotte Pipe and Foundry Company.
b. KBi.

2. CPVC and PVC one-piece fitting with one threaded brass or copper insert and one Schedule 80 solvent-cement-joint end.

B. Plastic-to-Metal Transition Unions:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Charlotte Pipe and Foundry Company.
b. KBi.
c. NIBCO INC.

2. MSS SP-107, CPVC and PVC union. Include brass or copper end, Schedule 80 solvent-cement-joint end, rubber gasket, and metal threaded union.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials, designed to join dis-similar metallic piping materials with dis-similar metals separated by dielectric material in a configuration to minimize galvanic corrosion of the less noble piping material.

B. 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:

1. Advance Products & Systems, Inc.
2. Capitol Manufacturing Company.
3. Central Plastics Company.
4. Elster-Perfection Corporation.
5. Hart Industries International, Inc.
6. Lochinvar Corporation.
7. Pipeline Seal and Insulator, Inc.
8. Precision Plumbing Products, Inc.
9. Sioux Chief Manufacturing Company, Inc.
10. Victaulic Company of America.
11. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
12. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.

C. All Materials: Suitable for system fluid, pressure, and temperature.

D. Dielectric Nipples:

1. Galvanized steel nipple with insert of noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

E. Dielectric Couplings:

1. Galvanized-steel coupling with insert of noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Unions:

1. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

G. Dielectric-Flange Kits:

1. Flange assembly kit for field assembly. Include full-face or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, steel backing washers, and appropriately sized bolts and heavy pattern nuts. Provide bolts of length as required for full engagement in nuts, of higher strength if undersized for bolt sleeves as required to maintain system working pressure.

2.6 VALVES

A. Isolation, Check, Balancing, Vent, and Drain Valves: Comply with requirements specified in Section 23 05 23 “General-Duty Valves for HVAC Piping”.
B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 23 09 00 “Instrumentation and Control for HVAC”.

2.7 HYDRONIC PIPING ACCESSORIES

A. Pipe Sleeves:

1. Sleeve 6-Inches Diameter and Smaller: Schedule 40 galvanized, welded steel pipe, ASTM A53, Grade A.

2. Sleeves Installed In Masonry Or Cold Formed Metal Framing/Gypsum Board Construction: Galvanized sheet metal, 20 gauge, round tube with welded longitudinal joint.

B. Escutcheons: Chrome plated, stamped steel, hinged, split-ring escutcheons, with setscrew. Inside diameter closely fits pipe outside diameter or outside diameter of pipe insulation where piping is insulated. Outside diameter completely covers opening in floor, wall, or ceiling.

1. Manufacturer: Manufacturers offering acceptable products include Grinnell.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Closed Loop Hydronic Piping aboveground, NPS 2 and smaller**:**

1. Type L drawn-temper copper tubing with wrought-copper fittings, and soldered, pressure-sealed or brazed joints.

B. Air-Conditioning Condensate Gravity Drain Piping:

1. Type M or L, drawn-temper copper tubing, wrought-copper drain fittings, and soldered joints.
2. Schedule 40 PVC or CPVC plastic pipe, DWV style fittings, and solvent-welded joints.

C. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated piping locations and arrangements were used to size piping, calculate friction loss, expansion compensation, pump sizing, fill volume, and other design considerations. Install piping generally as indicated unless deviations to layout are approved on Coordination Drawings.

B. Select system components with pressure rating equal to or greater than system operating pressure.

C. Install piping in concealed locations except in equipment rooms and service areas, unless otherwise indicated on drawings: install in walls, pipe chases, utility spaces, above ceilings, etc.

D. Install piping orthogonal to building walls as possible within constraints required for sloped drainage, non-orthogonal building construction, etc. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install fittings for changes in direction and branch connections, unless otherwise specified.

1. Branches two or more sizes smaller than main may be weld-o-let welded to steel pipe and brazed to copper using listed mechanically formed outlets similar to “T-drill”.

2. Minor offsets in copper fin-tube piping required to segment enclosures along curved exterior walls may be created by smooth bends in annealed type L or K copper tube. Do not bend fin element.

3. Mitered elbows, "shaped" nipples, and job fabricated reductions are not acceptable.

4. Where corridors or other general construction meets at angles other than standard pipe fitting angles, provide custom bend angle elbows to match general construction and maintain piping orthogonal to building.

F. Install piping so as to provide for positive drainage and air elimination.

1. Install straight piping free of sags and bends. Do not install bent piping – remove from site.

2. Install gravity drain lines at uniform slope down in direction of flow. Maintain maximum slope feasible up to one quarter inch rise per foot of run, but not less than 1% (approximately one eight inch per foot). Where height restrictions do not allow for minimum required slope, provide for pumped condensate removal as shown.

3. Install pressurized pumped flow piping at a uniform grade of 0.2 percent upward in direction of flow or at otherwise indicated slopes.

4. Avoid local high and low points where possible.

5. Install branch connections out the top of mains to serve equipment above mains, and out the bottom of mains to serve equipment below, or otherwise as required to provide drainage and venting with a minimum of drain and vent fittings.

6. Provide eccentric pipe size reducers and increasers, installed so as to allow for both positive drainage and air elimination. In general, where piping is sloped up in direction of flow, reduce pipe sizes with level side up and increase pipe sizes with level side down.

G. Install piping allowing for proper servicing of hydronic systems.

1. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

2. Install piping and specialties with sufficient clearance to allow application of specified insulation.

3. Install valves with sufficient clearance and orientation to permit both ease of operation and servicing.

4. Install dis-assemble able unions, flanges, or mechanical joints on equipment side of isolation valve**,** as required to remove and service all serviceable components without system drain-down or cutting piping. Install unions and flanges in piping,

a. Install adjacent to control valves, at final connections of equipment, as required to adjust threaded pipe joints after fixed (non-rotatable) joints are made, and elsewhere as indicated.

b. Install out of the line of coil pull, tube bundle removal access space, etc.

c. Install so sensor wires, thermometers, gauges, etc., need not be rotated, removed, or disconnected to service equipment.

d. Install within two feet of control valves with no elbows between valve and union as required for ease of replacement.

e. One dis-assemble able fitting may be used for two components (ex., both control valve and equipment service) if they are separated by no soldered, brazed, or welded elbows and no more than three feet of pipe.

H. Install sleeves for piping penetrations of walls, ceilings, and floors.

I. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors.

J. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.3 PIPE JOINT CONSTRUCTION

A. General Pipe Joint Construction:

1. Cut all pipe ends square.
2. Ream ends of pipes and tubes removing burrs past original pipe wall to restore full pipe ID.
3. Remove scale, slag, dirt, and debris from both inside and outside of piping and fittings before assembly.
4. Remake leaking joints using new materials.

B. Threaded Joints:

1. Provide threaded pipe ends in conformance with ANSI B1.20.1, tapered pipe thread standards

2. Cut threads full and clean using sharp cutting oil flooded dies.

3. Note internal length of threads in fittings or valve ends and proximity of internal seat or wall to determine pipe threading and align threads at point of assembly.

4. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified) and assemble joint “wrench-tight” with paired wrenches, one wrench on adjacent pipe and one wrench on valve end where pipe is threaded.

5. Damaged Threads: Do not use pipe or fittings with torn, corroded or damaged threads.

6. Do not use portions of pipe where weld opens during cutting or threading operations.

C. Soldered Joints:

1. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook,"

2. Square cut tubing to correct length required to fill sockets.

3. Ream ends and clean surfaces of oils, grease, and oxidation to bright finish with fine sand cloth, cleaning pads, or special wire brush.

4. Apply thin film of solder flux to both surfaces to be joined. Do not clean, flux and assemble joint more than 3 hours before soldering, and do not use acid core, paste type solder, or solder flux combinations.

5. Remove heat-sensitive portions of components prior to soldering. Provide wet rag strip heat sink wrapped around stem and seat of valves and protect all components for soldering heat damage. Replace any components with any evidence of heat damage.

6. Heat joint uniformly and rapidly and fill completely with solder while minimizing external and internal over-soldered dripping.

7. Disassemble joints for inspection of solder penetration as directed. Remake faulty joints at no additional cost.

D. Brazed Joints:

1. Comply with the procedures contained in AWS "Brazing Manual", using qualified processes and brazing operators according to Part 1 "Quality Assurance" Article.
2. Remove stems, seats, and packing of valves and accessible internal parts at piping specialties before brazing.
3. Fill the pipe and fittings with an inert gas (i.e. nitrogen or carbon dioxide) during brazing to prevent formation of scale.
4. Heat joints using oxyacetylene torch. Heat to proper and uniform temperature.
5. Completely fill sockets with braze materials, and make neat fillets on butt joints.

E. Plastic Piping Solvent-Welded Joints:

1. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

2. PVC Non-pressure Piping: Join according to ASTM D 2855.

3. Square cut and ream pipe ends to correct length.

4. Clean exterior of pipe and interior of fittings with rags and water and dry thoroughly before solvent cleaning with primer.

5. Check dry fit for interference fit to ensure pipe can be pushed at least 1/3 of way into fitting by hand. Ensure pipe that “bottoms” is snug.

6. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

7. Use only approved cement and primer suitable for types of pipes and fittings used and suitable for intended service, including temperature, pressure pipe size, and fluids served. Use only fresh cement; do not use thickened, lumpy, or "jelly like" cement.

8. Clean pipe and fitting with cement manufacturer’s primer or cleaner. Use contrasting color primer and cement.

9. Stir or shake cement before use. Apply thin coat of cement in socket, then evenly coat pipe end to socket depth. Avoid puddling, especially on thin walled pipe.

10. Assemble joint by twisting pipe 1/4 turn while pushing to full socket depth. Provide adequate anchorage and leverage to assemble pipe to full socket depth of fittings; hand pressure is inadequate and not acceptable for larger sizes. Hold pressure for 30 seconds or as required avoiding push out. Allow additional time for cement to set in colder weather to ensure cement film cures without blisters. Wipe off excess cement between socket and pipe with clean, dry rag.

11. Keep cement cool in hot weather and work as quickly as possible to avoid cement setting up before joint is assembled. Keep lid on cements, cleaner, and primers when not in use. Do not mix cleaner or primer with cement.

12. Use 3/4-inch dauber on small diameter pipes.

F. Pressure-Sealed Joints:

1. Make copper and copper alloy press connections in accordance with the manufacturer’s installation instructions.
2. Fully insert the tubing into the fitting with a visible mark on the tubing showing proper insertion. Align the tubing as required.
3. Check the fitting alignment against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. Leave insertion marks visible on pipe after assembly.
4. Press the joints using the tool(s) approved by the joint manufacturer in a manner to assure tubing remains properly aligned.
5. Remove and replace misaligned, kinked, or otherwise damaged tubing installations.

3.4 HYDRONIC SPECIALTIES INSTALLATION

A. At each system local or global low point, both in piping and heat transfer elements, and as required for complete system drainage, install drain consisting of a tee fitting and drain valve as described in Section 23 05 23 “General Duty Valves for HVAC Piping”.

B. At each system local or global high point, both in piping and heat transfer elements, at the end of each horizontal run before a drop in elevation, and elsewhere as required for complete and serviceable venting of system air, install vent consisting of a tee fitting and air vent as described in Section 23 05 23 “General Duty Valves for HVAC Piping”.

C. Install AC condensate termination strainers where AC condensate drips to any exterior point of indirect waste disposal.

D. Install all components of Energy Management and Control System (EMCS) into hydronic systems as required for complete EMCS installation and as required by this section maintaining integrity if hydronic systems. Coordinate all locations and quantities with contractor responsible for the EMCS – refer to Section 23 09 00 “Instrumentation and Control for HVAC”.

1. Install control valves in accessible locations close to connected equipment or as otherwise shown, with dis-assemble able connections.
2. Install wells for pressure, temperature, and other sensors as shown on details and as called for by the sequence of operations.

E. Install ports and wells for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

F. Install pressure / temperature test ports (P/T plugs) at the supply and return of every heat transfer element, and as otherwise called for on drawings.

G. Install piping to pumps. Details of near pump piping are specified in Section 23 21 23 “Hydronic Pumps”.

3.5 VALVE APPLICATIONS

A. Install General Duty Valves (isolation valves, balancing valves, air vent valves, and drain valves) as specified in Section 23 05 23 “General Duty Valves for HVAC Piping”.

3.6 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Section 23 05 29 "Hangers and Supports for HVAC Components". Comply with the following requirements for maximum spacing of supports.

B. Sound, vibration, and movement control is specified in Section 23 05 43 “Mechanical Vibration and Movement Control”.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Size supply and return piping run-outs to equipment connections same as shown on the drawings. Where connecting to existing piping run-outs, use same size as existing unless shown otherwise. Transition to equipment connection size close to equipment. If equipment connection size is smaller than piping shown, transition to piping size shown immediately with no elbows (except reducer elbows) or other fittings closer to the equipment than the required transition fitting.

B. Provide for thermal movement of piping adjacent to terminal equipment, using flexible hose connections, swing joints, etc. Refer to Section 23 05 43 “Mechanical Vibration and Movement Control” for details.

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.

2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.

3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.

2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.

3. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

4. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

5. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
4. Set temperature controls so all coils are calling for full flow.

END OF SECTION 23 21 13

SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant as scheduled:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of refrigerant, piping, valve, and refrigerant piping specialty proposed. Include pressure drop, based on manufacturer's test data, for the following:

1. Refrigerant.
2. VRF Manufacturer’s recommended refrigerant tubing, fittings, valves, etc.
3. Thermostatic expansion valves.
4. Solenoid valves.
5. Filter dryers.
6. Strainers.
7. Pressure-regulating valves.

B. Shop Drawings: Show diagrammatic layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Coordinate with VRF manufacturer to size piping and design actual 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.

1.6 CLOSEOUT SUBMITTALS

A. Field quality-control test reports.
B. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.8 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.9 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Specialties."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8.

E. 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-inchmisalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves as indicated herein and as recommended by VRF manufacturer:

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. Check Valves as indicated herein and as recommended by VRF manufacturer:

1. Body: Forged brass or cast bronze; globe pattern.
2. Bonnet: 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.

C. Service Valves as indicated herein and as recommended by VRF manufacturer:

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.

D. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by an NRTL as indicated herein and as recommended by VRF manufacturer.

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, replaceable AC coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and voltage as required.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Include Manual operator.

E. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL as indicated herein and as recommended by VRF manufacturer.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

F. Thermostatic Expansion Valves: Comply with AHRI 750 as indicated herein and as recommended by VRF manufacturer.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 700 psig.

G. Straight-Type Strainers as indicated herein and as recommended by VRF manufacturer:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

H. Angle-Type Strainers as indicated herein and as recommended by VRF manufacturer:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

I. Moisture/Liquid Indicators as indicated herein and as recommended by VRF manufacturer:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

J. Replaceable-Core Filter Dryers: Comply with AHRI 730, and as indicated herein and as recommended by VRF manufacturer:

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: as recommended by VRF manufacturer.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: Refer to drawing schedules and manufacturer’s data.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

K. Permanent Filter Dryers: Comply with AHRI 730, and as indicated herein and as recommended by VRF manufacturer:

1. Body and Cover: Painted-steel shell
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: as recommended by VRF manufacturer.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: Refer to drawing schedules and manufacturer’s data.
9. Working Pressure Rating: 500 psig.

L. Mufflers as indicated herein and as recommended by VRF manufacturer::

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

M. Receivers: Comply with AHRI 495, and as indicated herein and as recommended by VRF manufacturer:

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

N. Liquid Accumulators: Comply with AHRI 495 and as indicated herein and as recommended by VRF manufacturer:

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.3 REFRIGERANTS

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. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R454B.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R454B

A. Suction Lines NPS 1-1/2and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless 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 diaphragm packless valves on inlet and outlet side of filter dryers.

E. 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.

F. 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.

G. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Thermostatic expansion valves.
2. Hot-gas bypass valves.
3. Compressor.

H. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor, if not provided as part of installed equipment manufacturer.

I. Install receivers sized to accommodate pump-down charge.

J. 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. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground. Provide for drainage and liquid accumulation.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Components."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23.

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23.

T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. 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 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. 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 Part 1 "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.

3.6 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.

3.7 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 controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.
2. Open compressor suction and discharge valves.
3. Open refrigerant valves except bypass valves that are used for other purposes.
4. 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 23 23 00

SECTION 23 31 00 - DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sheet metal duct materials and construction.
2. Sheet metal duct fittings materials and construction.
3. Flexible duct and connectors.
4. Ductwork ancillary components materials and construction.

1.3 DEFINITIONS

A. Aspect Ratio: The ratio of duct width to height.

B. Hydraulic Radius: The ratio of duct cross section area to perimeter, or practically, a term used to define flow resistance of duct with differing aspect ratios, with resistance to flow being approximately proportional to hydraulic radius.

C. NRC: Noise Reduction Criteria

D. Offset: A change in the duct centerline location but not direction occurring within one piece of duct.

E. RGD: Registers, Grilles, and/or Diffusers

F. STC: Sound Transmission Class

1.4 PERFORMANCE REQUIREMENTS

A. Provide duct system able to withstand the loads and stresses described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and these contract documents.

B. Fabricate outdoor duct and casings to withstand wind load and snow load indicated on Structural series drawings and specifications. Calculate the snow load as a negative pressure on the top duct surface.

C. Fabricate ductwork able to withstand the forces imposed by the support and restraint system. Refer to Specification Section 23 05 48 “Mechanical Wind Load Control” for additional information and requirements.

D. Provide all duct systems continuously electrically bonded to ground.

1.5 SUBMITTALS

A. Comply with requirements of SECTION 01 33 00 “Submittal Procedures” and as modified below.

B. Identify in writing, any proposed deviations from contract Drawings and Specifications.

1. Highlight all changes from plans required by obstructions and job conditions.

2. Bring any proposed deviations from contract plans and specifications to Architect's attention in writing, by separate letter attached to submittal with proposed deviations, along with samples for clarification, demonstrating benefit to Owner.

C. Product Data: Submit for approval annotated Shop Construction Standards showing upgrades as required for conformance in detail to specifications for all factory and shop fabricated air ducts, components, and accessories.

D. Shop Drawings:

1. Prepare and submit 1/4" = 1’ scale or larger shop drawings for all areas within 30 days after contract award unless Architect, Construction Manager, and Owner agree in writing upon another shop drawing schedule. Refer to section 01 33 00 “Submittal Procedures” for additional information. Include approved Ductwork Accessories after approval as part of Section 23 33 00 submittals.

a. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
b. Factory- and shop-fabricated ducts and fittings.
c. Duct layout indicating sizes, configuration, liner material, and SMACNA pressure class required for all duct.
d. Indicate duct elevation above floor (top and bottom of ducts), bottom of structure especially at critical passages, and ceiling height for each room.
e. Dimensions of main duct runs from building grid lines.
f. Fittings.
g. Reinforcement and spacing.
h. Seam and joint construction.
i. Penetrations through fire-rated and other partitions.
j. Equipment and accessories installation based on equipment being used on Project.
k. Indicate locations and sizes of all dampers, turning vanes, access doors and panels, and other required accessories.

E. Coordination Drawings:

1. Prepare 1/4" = 1’ scale or larger drawings for all areas requiring coordination drawings within 15 days after Duct Shop Drawing approval unless Architect, Construction Manager, and Owner agree in writing upon another coordination drawing schedule. Refer to Section 01 31 00 – Project Management and Coordination, Section 01 33 00 “Submittal Procedures” and Section 23 33 00 “Ductwork Accessories”, for additional information.

    a. Begin with approved shop drawings.

    b. Incorporate dimensions shown on contract documents and those of actual equipment proposed. (Including duct, piping, equipment, suspended ceiling components, light fixtures, structural steel adjacent to duct, service clearance, etc.)

    c. Detail duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.

    d. Show adequate sections, elevations and plan views required to demonstrate reasonable installation and service is possible.

    e. Include 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.

    f. Include all structural members to which duct will be attached.

    g. Coordinate with and include TAB agency commentary as described in Section 23 05 93.

    h. Include size and location of all floor, wall, and roof openings. Highlight penetrations of smoke barriers and fire-rated construction

    i. Include items penetrating finished ceiling including the following:

        1) Lighting fixtures.
        2) Air outlets and inlets.
        3) Mechanical Equipment.
        4) Fire Alarm Devices.
        5) Speakers.
        6) Soffits.
        7) Perimeter moldings.

2. Submit Coordination Drawings to Construction Manager, and each affected Prime Contractor for review and coordination in accordance with the schedule agreed upon during the coordination meetings.

1.6 CLOSEOUT SUBMITTALS

A. Contract Closeout Submittals: Comply with requirements of SECTION 01 77 00 “Closeout Procedures”, including submission of operating and maintenance instructions as item in "Operating and Maintenance Data" manual described in that section.

B. Field quality-control reports – duct leakage, duct cleanliness.

1.7 QUALITY ASSURANCE

A. Provide ductwork by experienced and approved workers specializing in sheet metal fabrication and installation in accordance with the stricter of the below referenced standards and the requirements outlined in these contract documents.

B. Referenced Standards

1. The latest editions of the publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

2. American Conference of Governmental Industrial Hygienists

   a. “Industrial Ventilation – A Manual of Recommended Practice for Design”, for contaminant control and industrial ventilation design

3. American Society of Civil Engineers (ASCE):

   a. ASCE7 Minimum Design Loads for Buildings and Other Structures

4. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

   a. ASHRAE / ANSI 62.1 – Ventilation for Acceptable Indoor Air Quality.
   b. ASHRAE / ANSI 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings

5. American Welding Society (AWS)

   a. AWS D1.1, "Structural Welding Code - Steel," for hangers and supports.
   b. AWS D1.2, "Structural Welding Code - Aluminum," for aluminum supports.
   c. AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

6. American Society for Testing and Materials (ASTM):

   a. A167 99 Standard Specification for Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet, and Strip

   b. A653-09 Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy coated (Galvannealed) by the Hot-Dip process

   c. A1011-09a Standard Specification for Steel, Sheet and Strip, Hot rolled, Carbon, structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength

d. B209 07 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate

e. C1071-05e1 Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)

f. D6386 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

g. D7803 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating

h. E84-09a Standard Test Method for Surface Burning Characteristics of Building Materials

7. National Air Duct Cleaners Association (NADCA):

a. ACR "Assessment, Cleaning and Restoration of HVAC Systems", for duct cleanliness standards.

8. National Fire Protection Association (NFPA):

a. 90A Standard for the Installation of Air Conditioning and Ventilating Systems
b. 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

9. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

a. HVAC Duct Construction Standards, Metal and Flexible
b. HVAC Air Duct Leakage Test Manual

10. Underwriters Laboratories, Inc. (UL):

a. 181 Factory Made Air Ducts and Air Connectors
b. 555 Standard for Fire Dampers
c. 555S Standard for Smoke Dampers

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

A. General Material Requirements:

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated.

2. Provide sheet metals per mill specs and free of pits, voids, seam or roller marks, stains, discolorations, inadvertent bends and kinks, and other imperfections.

B. Standard Supply, Return and Exhaust: Galvanized steel, ASTM A-653/653M G90, lock forming quality, unless otherwise specified.

C. Standard Supply, Return and Exhaust duct which will be exposed to view in the finished project and will not be externally insulated or painted: Galvannealed steel, ASTM A-653/653M G90, lock forming quality, unless otherwise noted.

D. Standard Supply, Return and Exhaust duct which will be exposed to view in the finished project and will be painted: Galvannealed steel, ASTM A-653/653M G90, lock forming quality, prepared for painting via mill phosphatizing and subsequent heat treatment in accordance with ASTM D6386 and ASTM D7803 as applicable, unless otherwise noted.

E. Kitchen supply and exhaust duct service, dishwasher exhaust service: ASTM A 480/A 480M, Type 304L or 316L Stainless-Steel Sheets; cold rolled, annealed. Minimum surface finish for concealed duct No. 2B exterior of duct, No. 2D interior of duct.

F. Flexible Ducts:

1. Flexible Duct (standard ventilation air register, grille, and diffuser connections where noted on Drawings. Maximum installed length to be 5'-0"): Medium pressure CPE or polymeric coated woven fiberglass cloth liner, enclosed spring steel wire, R-6 fiberglass insulation covered by metalized polyester film bi-directionally reinforced vapor barrier. Similar to types S-TL (uninsulated for field insulation), M-KE, or M-KC, with FlexFlow elbow supports, all by Thermaflex (design make).

2. Flexible Duct (Ambient Temperature abuse resistant applications similar to wood dust exhaust systems): Minimum factory temperature rating of 200 deg. F., constructed with two ply, triple overlap, fully EPDM impregnated woven abrasion resistant, fire retardant fabric with an enclosed spring steel wire, and extra abrasion resistant strip covering wire. Factory attached fittings. Type "NE" by Car-Mon Products (design make).

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, and use stainless steel fasteners.

2.2 RECTANGULAR DUCTS AND FITTINGS

A. Conform to appropriate SMACNA rectangular duct reinforcement tables and figures for the velocity-pressure classification duct construction required as defined in part three of this document, and additionally as follows.

1. Seal all joints and seams in accordance with SMACNA seal classification required for duct in question.

a. Additionally, seal field assembled longitudinal seams for seal class B duct.

2. Transverse Joints: in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure for "Rectangular Duct/Transverse Joints".

    a. For all duct requiring reinforcement, provide SMACNA T-24 or T-25 type flanged duct connection system at traverse joints.

        1) Joints may be factory manufactured slip on type or integrally shop fabricated onto the duct sheet metal on machinery designed for that purpose. Corner closure pieces are required at each corner.

        2) Manufacturers: Subject to compliance with requirements, available manufacturers offering pre-manufactured slip on reinforcement products that may be incorporated into the Work include, but are not limited to, the following:

            a) Ductmate Industries, Inc, or equal.
            b) Lockformer TDC or equal.
            c) Nexus PDQ type G or J or equal.

3. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

4. Tie rods are not permitted on duct or plenums narrower than 72". Where an option for tie rod or heavier gauge sheet metal / shorter joint length / higher category reinforcement is presented in table, the heavier, shorter, more reinforced duct with no tie rods is required.

B. Offsets:

1. Where offset dimension is equal to or less than 0.2 times duct dimension in plane of offset, offset may be angled at maximum 15 degrees (SMACNA type 1).

2. Where offset dimension is greater than 0.2 times duct dimension in plane of offset (example: 10 x 20 duct offset in plane of 10" dimension greater than 2 inches), offset to consist of paired curved elbows, each of the required angle, combined into one fitting (SMACNA type 3).

    a. Conform to elbow requirements as indicated below.
    b. Offset may be replaced with paired curved elbows if required for installation, otherwise provide combined fitting.

C. Transitions of shape or cross section:

1. Reductions in cross section shall have a maximum included cone angle of 60 deg., with a maximum single side angle of 45 deg. from axial, unless otherwise specified in writing.

2. Transformations of section without a net reduction of cross section shall have no section of reduced hydraulic radius nor any local expansion of more than 15 deg. net included cone angle, as defined by ASHRAE and SMACNA.

3. Expansion sections, unless specifically drawn and noted otherwise, shall have:

    a. No section of reduced hydraulic radius
    b. No section of local expansion of more than 15 deg. net included cone angle.
    c. No single side expansion angle of more than 15 deg. from axial unless otherwise specified in writing.

D. Elbows:

1. Make all changes in direction (as opposed to offsets above where direction remains the same) regardless of angle with elbow fittings unless specifically drawn and noted otherwise.

2. Curved Rectangular Elbows:

    a. Along critical pressure drop paths, provide curved rectangular elbows.

        1) Critical pressure drop paths shall be as indicated on drawings or if not indicated shall be considered to be entire duct run from air handling unit along mains to or from furthest terminal. Systems with more than one main branch shall be considered to have more than one critical pressure drop path.

        2) Provide critical path elbows with throat radius not less than dimension of duct in plane of radius or use smaller inner radius elbows with splitter vanes such that the ratio of inner to outer radius of curvature of any section of the elbow shall not be less than 1/2.

    b. Along non-critical pressure drop paths, curved rectangular elbow radius requirements may be relaxed to a throat radius not less than one half the dimension of the duct in plane of radius or use smaller inner radius with splitter vanes such that the ratio of inner to outer radius of curvature of any section of the elbow shall not be less than 1/3.

    c. Construct all curved elbows of increasing or decreasing cross section in accordance with critical pressure drop path criteria.

    d. Fabricate splitter vanes per SMACNA Duct Manual construction standards.

3. Double Wall Turning Vanes

    a. Provide for mitered rectangular elbows of equal inlet and outlet or increasing cross section

    b. Blades of hollow double wall construction, with smaller radius sheet metal form nested outside larger radius form, tapering down gradually to and welded at double thickness edge, designed for specific spacing and alignment to minimize separation of flow and pressure drop through air duct elbows.

    c. Properly spaced to result in constant cross-section area between blades: smaller radius blades to have closer spacing

d. Maximum spacing 3 inch, unless otherwise approved.

e. Acoustical type where called for or where installed in acoustically lined ductwork.

f. Provide products by one of the following:

1) Titus or equal
2) Elgen or equal
3) Hardcast or equal.

4. Single Wall Turning Vanes

a. Provide in mitered rectangular elbows of increasing or decreasing cross section and those with a turning angle greater than 100 degrees or less than 80 degrees.

b. Blades of single wall 16 gauge construction with leading and trailing edges aligned to the direction of flow, installed per SMACNA Duct Manual standards so as to provide smooth area transition. Maximum spacing 3 inch, unless otherwise approved.

E. Duct Branches:

1. Install branches, inlets, and outlets so that air turbulence is reduced to a minimum and air volume properly apportioned. Install airflow adjustment devices at all junctions to permit adjustment of the amount of air entering or leaving the branch.

2. Where a duct branch is to handle more than 25 percent of the air handled by the duct main, use a complete elbow as specified, assembled into a single fitting with the main duct. Size the separate branch and remaining main as shown on the drawings, and partition the division of the combined duct such that each of the branch and main have the same velocity, with cross sectional area proportional to the respective airflow. Join the leading / trailing edge where the branch and main meet airtight via welding or brazing.

3. Where a duct branch is to handle less than 25 percent of the air handled by the duct main, construct the branch connection with a 45 degree side take-off with volume damper in branch line close to takeoff. Round branches off of rectangular main, use 45 deg. entry takeoff with integral transition to round.

a. Supply: increase duct dimension on upstream side of branch by 25 percent, minimum 4 inch.
b. Return: increase duct dimension on downstream side of branch by 25 percent, minimum 4 inch.
c. Multiple flow direction takeoffs: provide twin entries or bell mouths.

4. Where an air-diffusion device is shown as being installed in close proximity to (less than one main duct width) the side, top, or bottom of a duct, provide a commercially manufactured vaned volume extractor fitting to allow adjustment of the air quantity and to provide an even flow of air across the device it services.

F. Duct Entries

1. Wherever air does not enter the duct system from grilles, registers, or louvers, but instead enters directly from an enclosed or exposed plenum space, provide a duct entry transition with a minimum area ratio of inlet to nominal duct size of 2:1 unless otherwise specifically shown and noted.

2. Duct entry may be angled (pyramidal or conical) or with bell-mouth radius.

   a. Provide angled duct entries with a maximum single side angle to axial of 30 deg. Any combination of sides, top, and bottom may be angled (or conical for round duct) to suit space restrictions, but maintain the specified area ratio.

   b. Provide bell-mouthed entries with radius as required maintaining the specified area ratio.

3. Provide entry grille or if not shown, provide at minimum 1/2 inch welded wire mesh (WWM) secured over the large side of the opening of all duct entries.

2.3 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Spiral lock-seam duct, joints, and fittings:

      1) Lindab Inc.
      2) McGill AirFlow LLC.
      3) SEMCO Incorporated.
      4) Sheet Metal Connectors, Inc.
      5) Spiral Manufacturing Co., Inc.

   b. Longitudinal fusion-welded duct, joints, and fittings as described in appropriate SMACNA manuals and herein – shop fabricated.

   c. 26 ga. G-60 longitudinal snap-lock construction duct, joints, and fittings.

B. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", and as follows:

1. Spiral lock seam duct:

    a. Machine locked spiral seams with or without formed standing reinforcement ribs.
    b. Leakage through the duct wall and joints certified no greater than design make.
    c. Provide minimum 12 ft. long un-joined lengths, except where interrupted by fittings.

2. Longitudinal seam duct shall have fusion-welded butt seams.

    a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
    b. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

3. Snap-lock seam duct:

    a. Limit snap-lock construction components and systems to concealed round duct run-outs to individual diffusers, registers, and grilles, in sizes 12 inch and under, with all transverse and longitudinal seams sealed.

    b. Longitudinal seams field assembled by interlocking machine formed sprung tabs, with sealant brushed on before and after assembly.

    c. Provide minimum 10 ft. long un-joined lengths, except where interrupted by fittings or shorter lengths are required to work through existing structure.

C. Transverse Joints - Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", and as follows:

1. 24 in. diameter and less: slip fit collars or sleeve couplings, reinforced by rolled beads, insertion length 2 inch. Secure with hexagon head drill point screws or other approved mechanical fasteners 6 inch o.c. max and duct sealant.

D. Elbows:

1. Fabricated to a centerline radius of minimum 1.5 times the cross-section diameter.

    a. Where space constrictions do not allow specified centerline radius or where shown as such on drawings only, provide mitered elbow of fully welded construction with single thickness turning vanes spaced 3 inch o.c. max.

2. For use with snap-lock round duct, where allowed as described above: Gored adjustable elbows, seal adjustable joints after installation.

3. For standard bends (ex. 45 deg. and 90 deg.), diameters through 9 inch: Two-section stamped and welded 22 ga. elbows.

4. Diameters 10 inch through 30 inch, any angle: Gored standing seam construction similar to United McGill “UNI-SEAM”. Less than 36 deg. - two gores, 36 deg. to 72 deg. - three gores, over 72 deg. - five gores.

5. Diameters over 30 inch and odd angles under 10 inch: Gored construction with gores stitch welded 6 inch o.c. max and sealed with duct sealant. Less than 35 deg. - two gores, 36 deg. to 71 deg. -three gores, over 71 deg. - five gores.

E. Tees and Lateral Branches: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", and as follows:

1. Bull-Headed Tees:

   a. Provide wye fitting with subsequent partial bend elbows for critical run bull-headed tees.
   b. Provide capped main and twin lateral branches as described below for general purpose bull-headed tees.
   c. Provide “bird-mouthed” fitting with turning vanes only where space restrictions require and where specifically shown as such on the drawings.

2. Fabricate lateral tees and all branches with fittings as described herein:

   a. Fabricate to longitudinal welded duct standards. Where possible, provide gored standing seam construction similar to United McGill “UNI-SEAM”, otherwise stitch or button welded or riveted. Seal all joints.

   b. Fitting entrance free of weld build-up or spatter, burrs, or irregularities, not projecting into either the main or branch runs.

   c. Provide manual volume damper at all branch connections.

   d. Typical round branch connections to round main duct, provide 45 deg. reducing lateral takeoff fitting, with subsequent elbow resulting in required branch angle to main.

      1) Where space restrictions do not permit this combination, provide 90 deg. angled rectangular to round takeoff fitting “birdmouthed” to main, or conical takeoff with similar loss coefficient.

      2) For critical run (i.e., maximum pressure drop) round branch connections to round main ductwork, provide high performance 45 deg. reducing conical lateral takeoff fitting, with subsequent elbow resulting in required branch angle to main.

3) Exposed, duct side mounted register connections may be tapped into side wall of length of duct. Where an air-diffusion device is shown as being installed in close proximity to (less than one main duct width) the side, top, or bottom of a duct, provide a commercially manufactured vaned volume extractor fitting to allow adjustment of the air quantity and to provide an even flow of air across the device it services.

F. Offsets:

1. All offsets to consist of paired curved elbows, each of the required angle, combined into one fitting.

G. Transitions of shape or cross section and duct entries:

1. As described for rectangular duct above.

2.4 EXTERIOR DUCT

A. Construction as detailed above with the additional requirements listed herein.

B. Seal all exterior duct completely water tight, including all longitudinal and transverse seams, fittings, and branch connections. Seal both during assembly and from the exterior. Use only exterior all weather grade gaskets and sealants. Apply sealants neatly, avoiding exposed sealant on surface. Where sealant must be exposed for function apply in neat fillets.

C. Fabricate all transverse joints using an INTEGRAL standing flange reinforcement similar to SMACNA T-24 or T25 as described in the SMACNA HVAC Duct Construction Standards Manual. Use of “slip-on” reinforcing flanges not permitted.

D. Install all exterior duct with minimum 1 inch per 10 ft pitch to avoid standing water puddles on top surface.

2.5 TYPE I AND TYPE II KITCHEN HOOD EXHAUST DUCTS:

A. Type I and Type II hood service duct: in compliance with NFPA 96, all related code requirements, and the additional requirements of this section.

B. Material: 18 gage minimum stainless steel, number 4 polish for duct exposed to view in finished space.

C. Construction:

1. Fabricate duct from minimum 18 gauge externally continuously TIG welded stainless steel, not cross-broken.

2. Grind and polish all welds to match #4 finish and remove all weld heat discoloration. Distortion from overheating or forcing is unacceptable.

3. Smooth radius elbows with ratio of outer radius to inner radius no greater than 2, smooth transitions with no steps, no mechanical fasteners extending into airstream, eliminate all eddies and other locations where grease or condensate will inadvertently accumulate.

4. Prove liquid tight at all welds, seams, and joints.

D. Slope duct continuously per code and NFPA, minimum one quarter inch per foot (1:48 or 2% slope) up to 75 feet horizontal, or above 75 feet horizontal at one inch per foot (1:12 or 8.3% slope) preferably back to the equipment, or to a grease reservoir.

1. Where ducts are not self-draining to equipment provide low point grease reservoir / drain pockets at all duct low points:

a. Full width of duct, welded construction, twelve inches (12") long in direction of airflow and one inch (1") deep minimum, bottom sloped deeper towards drain for positive drainage with welded on stainless steel drain pipe nipple with ¾" NPT threaded connection point outside of insulation.

b. Type I service connection: valve and capped hose thread for periodic grease collection

c. Type II service connection: trapped as required for system pressure and connected to condensate drain pipe as specified, extended to sanitary sewer through grease trap.

E. Verify size of hood and fan duct connections in field, provide duct to fit equipment connections with smooth transitions to duct size indicated or if not indicated on drawings to next full inch size smaller than that which would have velocity of 1500 fpm at given cfm. Configure duct so that duct velocity is not less than 500 fpm at any point in the duct.

F. Provide access doors or panels for duct cleaning on horizontal duct at grease reservoir / drain pockets, at 12 foot intervals, and at each change of direction. Access doors or panels shall be of the same material and thickness of the duct with reinforced flanges, flush interior surfaces, water and grease-tight high temperature gaskets and sealants, and easily reusable fire rated insulation covers.

1. Type I access door assemblies complete, rated for1500 degrees F service.

G. Where clearance to other construction permits, double-wall insulated factory-built grease duct and accessories, inner and outer walls 300 series stainless steel, UL labeled and complying with NFPA 96 may be used in lieu of specified materials, with installation in compliance with the manufacturers' requirements. Convert any square and rectangular duct shown on the drawings to round size of equal or greater hydraulic radius with custom transitions meeting all the requirements of this specification.

2.6 DUCTWORK ANCILLARY COMPONENTS

A. In general, duct accessories associated with specialized requirements which are called out and / or scheduled on the drawings are specified in section 23 33 00 “Air Duct Accessories”. The ancillary components included in this section are generally required in all air duct systems, need not be specifically called for on the drawings other than by specification or standard symbols and abbreviations, and are required to be detailed in the shop standards submittal.

B. Duct Connectors:

1. Flange Connectors

a. Refer to flange reinforced transverse joint system described under duct construction above. Flanged connections to system components other than adjacent duct sections may be fabricated similar to a transverse joint. If required to connect to equipment or components of different configuration provide flanged connector custom fabricated of reinforcement shapes as specified.

b. Material: Match adjacent duct.

2. Flexible Connectors - Duct to Equipment:

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) Ductmate Industries, Inc.
2) Duro Dyne Inc.
3) Ventfabrics, Inc.
4) Ward Industries, Inc.; a division of Hart & Cooley, Inc.

b. Provide factory fabricated flexible connectors with heavy gauge metal edge bands double roll crimped each side onto water, flame-retardant, mildew resistant, NFPA approved flexible fabric connector strip.

c. Metal Edge Bands: 2 strips of 2-3/4 inches wide, 0.028-inch- thick G90 galvanized sheet or stainless steel, or 0.032-inch- thick aluminum sheets. Provide same metal and corrosion resistance as connected ducts.

d. Fabric Connector Strip: minimum 3-1/2 inches wide, 20 oz. per square yard fiberglass fabric strip double coated with neoprene (general service), hypalon (outdoors), nitrile (chemical resistant service similar to fume hoods), or silicone (high temperature service similar to kiln or engine exhaust).

e. Coatings and Adhesives: Comply with UL 181, Class 1.

3. Electrical Bonding Connectors:

a. Provide complete system of electrical bonding across all electrical discontinuities resulting from non-conducting duct work components. Refer to section 26 05 26 “Grounding and Bonding of Electrical Systems”.

C. Airflow Adjusters:

1. Single Blade Volume and Splitter Dampers:

a. Construction per SMACNA Duct Manual and as noted below.

b. Materials: Match associated duct corrosion resistance requirements.

c. Provide double wall airfoil blade dampers where duct velocity is over 1000 fpm nominal.

d. Maximum blade width 12 inches.

e. Multiple dampers or manufactured multi-blade damper above 600 square inches duct cross section.

f. Bearings and Adjusters:

1) Heavy duty quadrant adjusters with 12 gauge offset handle, captive bolt/wing nut lock in 2" minimum radius slot, split clamp with bolt on 3/8" shaft up to 300 square inch duct, ½" shaft for duct up to 600 square inch cross section.

2) Closed end bearings for duct rated for 2" WG and above.

3) Standoff under quadrant placing quadrant outside of specified duct insulation. Insulate between duct and quadrant.

4) When occurring in acoustically lined ducts, install with insulated "build-outs" per Duct Manual.

2. Multi-blade Manual Volume Dampers:

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) Air Balance Inc.; a division of Mestek, Inc.
2) American Warming and Ventilating; a division of Mestek, Inc.
3) Flexmaster U.S.A., Inc.
4) McGill AirFlow LLC.
5) Nailor Industries Inc.
6) Ruskin Company.
7) Trox USA Inc.
8) Vent Products Company, Inc.

b. Materials: Match associated duct corrosion resistance requirements.

c. Standard leakage rating.

d. Suitable for horizontal or vertical applications.

e. Frames:

1) Hat-shaped channels 0.064-inch minimum thickness.
2) Mitered and welded corners.
3) Flanges for attaching to walls and flangeless frames for installing in ducts.

f. Blades:

1) Opposed-blade design standard unless otherwise noted.
2) Stiffen damper blades for stability.
3) Formed single thickness blades allowed up to 1000 feet per minute (fpm) design duct velocity; provide airfoil blades above 1000 fpm.
4) Same material as ductwork, 0.064 inch thick.

g. Blade Axles: full length of damper blades, bearings at both ends of operating shaft.

h. Bearings: Oil-impregnated bronze, molded synthetic, or stainless-steel sleeve bearing as applicable.

i. Tie Bars and Brackets: Galvanized steel.

j. Damper Hardware:

1) Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2) Include center hole to suit damper operating-rod size.
3) Include elevated platform for insulated duct mounting.

k. Jackshaft:

1) Provide as required for adjusting multi section multi-blade dampers simultaneously.

2) Size: 1-inch diameter.

3) Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

4) Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Duct Access Control:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following. Note not all manufacturers offer all products:

a. American Warming and Ventilating; a division of Mestek, Inc.
b. Carnes.
c. Cesco Products; a division of Mestek, Inc.
d. Ductmate Industries, Inc.

e. Flame Gard, Inc.
f. Flexmaster U.S.A., Inc.
g. Greenheck Fan Corporation.
h. KEES, Inc.
i. Lloyd Industries, Inc.
j. Metal Form Manufacturing, Inc.
k. McGill AirFlow LLC.
l. 3M
m. Nailor Industries Inc.
n. Price Industries.
o. Ventfabrics, Inc.
p. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

2. General Purpose Duct-Mounted Service Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

   a. Door:

      1) Double wall, rectangular.
      2) Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
      3) Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
      4) Fabricate doors airtight and suitable for duct pressure class.

   b. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

   c. Number of Hinges and Locks:

      1) Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
      2) Access Doors up to 18 Inches Square: Two hinges and two sash locks.

3. Grease Duct or Type I Cooking Hood Exhaust Duct Access Door:

   a. UL 1978 listed, meets NFPA 96 standards.
   b. Twin layer 11 gauge (0.120-inch) panels, same steel as duct.
   c. Minimal protrusion into duct, no more than inner door thickness.
   d. Inner panel with profiled access opening welded to duct interior, with welded on studs.
   e. Outer door hinged to duct with full coverage ceramic gasket rated for 2300 deg F.
   f. Hinge welded to duct, screwed to outer completely removable for cleaning panel.
   g. Tool free access: perimeter studs with wing nuts.
   h. Center handle folds flat under insulation.
   i. Provide with extension bolts/coupling nuts or extended studs and UL listed reusable insulation cover and plate.

4. Grease Duct or Type I Cooking Hood Exhaust Duct Access Panel:

   a. UL 1978 listed, meets NFPA 96 standards.
   b. Twin layer 11 gauge (0.120-inch) panels, same steel as duct.
   c. Minimal protrusion into duct, no more than inner door thickness.
   d. Ceramic board gasket rated for 2300 deg F covers entire outer door.
   e. Tool free access with center and perimeter studs with wing nuts.
   f. Easily removable for cleaning.
   g. Center handle folds flat under insulation.
   h. Provide with extended studs and UL listed reusable insulation cover and plate.

5. Instrument Test Access 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.

2.7 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. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

2. Tape Width: 4 inches.

3. Sealant: Modified styrene acrylic.

4. Water resistant.

5. Mold and mildew resistant.

6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.

7. Service: Indoor and outdoor.

8. Service Temperature: Minus 40 to plus 200 deg F.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

11. Sealant 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. 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.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.

2. Type: S.

3. Grade: NS.

4. Class: 25.

5. Use: O.

6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealant 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."

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.

2.8 HANGERS AND SUPPORTS

A. Provide complete system of Air Duct Hangers and Supports as required by the Air Duct systems included. Refer to Section 23 05 29 “Hangers and Supports for HVAC Components” for details of Hanger and Support requirements for Air Ducts and associated components.

B. Provide complete system of Air Duct Vibration and Movement Control as required by the Air Duct systems included. Refer to Section 23 05 43 “Mechanical Vibration and Movement Control” for details of vibration isolation and movement control requirements for Air Ducts and associated components.

C. Flexible Duct Supports and Accessories:

1. Elbow Supports: UL listed for plenum installation molded fiber reinforced plastic elbow support at connections to ceiling mounted devices designed to maintain tension in flex duct and eliminate collapsed elbows. Basis of design: Thermaflex FlexFlow elbows.

2. Flexible Duct Supports: UL listed for plenum installation molded fiber reinforced plastic 1-1/2” wide straps adjustable for 4” to 16” diameter flex duct, supports duct without damaging vapor barrier or collapsing soft insulation or duct. Basis of design: Thermaflex FlexTie straps.

3. Clamps: Re-usable stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size, or single use “zip-tie” strap of plenum rated plastic, sizes 3 through 10 inches diameter maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions under which duct work is to be installed for compliance with requirements for proper installation.

1. Check all drawings for detailed information and locations and field verify all conditions affecting installation.
2. Notify Architect in writing of any conditions detrimental to proper and timely installation.
3. Obtain Architect’s approval before fabrication of any changes in size required by obstructions and job conditions.
4. Proceed with installation only after unsatisfactory conditions have been corrected in an acceptable manner.
5. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 DUCT FABRICATION

A. Fabricate and install as shown on Drawings and in manner coordinated with all construction requirements.

B. Sizes shown on plans are clear inside duct dimensions representing the design hydraulic radius of the duct. Generally, fabricate ductwork of sizes shown on plans. During field verification, confirm that duct of aspect ratio shown fits within general construction constraints coordinated with all other trades. Adjust aspect ratio, joint spacing, reinforcement, etc., as required during coordination process to fit duct of equivalent hydraulic radius where shown. If duct of reduced hydraulic radius is required due to field conditions, submit RFI for direction before proceeding.

C. Flexible Connections: Provided at intake and discharge connections to all motor powered fan air handling equipment and other vibration isolated air handling component connections.

D. Fabricate all ductwork to the SMACNA pressure classification reinforcement standards shown on the drawings and to the following minimum standards.

1. Conform to special duct pressure classification requirements for all duct between air handler blowers and last fire or fire/smoke damper in series, and duct after the last fire or fire/smoke damper in series up to the next 90 deg. turn:

    a. Fabricate to the SMACNA pressure classification reinforcement standards required by the system supply or return blower dynamic stall pressure; assume the larger of 200% of external operating pressure scheduled or 150% of fan total pressure listed as a minimum. VIF with approved equipment fan curves and adjust pressure classification values accordingly.

2. Where there are no fire or fire / smoke dampers and past the 90 degree turn mentioned above, complete to the last branch duct volume damper, VAV box, induction unit, or other pressure restricting device, fabricate duct to pressure classification as required by the system supply or return operating pressure listed on the drawings, minimum plus or minus two (2) inch water column.

3. Fabricate branch run-out duct between the last pressure restricting device and the air terminal register, grille, or diffuser to minimum plus or minus one (1) inch water column pressure classification.

E. Deliver and store all duct with duct interior clean and all openings sealed with film designed for the purpose of keeping uninstalled duct clean. Unless section of duct is being actively extended during construction, keep all openings and RGD properly sealed and prevent entrance of dust, dirt, construction debris, etc.

F. Extend all access openings, damper rods, and levers to outside of external insulation for convenience of operation and maintenance.

G. Provide all necessary transitions, fittings, aspect ratio changes, etc., as required to install duct work. Where aspect ratio changes are required to fit within structural or other existing construction constraints, provide duct of equal or larger hydraulic radius.

3.3 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 concealed in general construction unless otherwise specified or indicated on Drawings.

C. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

D. Provide all necessary openings, sleeves, hanger inserts, chases, recesses, etc., in general construction work. Coordinate duct openings provided by others in ample time to avoid delays.

E. Provide collars to trim all duct openings in general construction work.

F. Make final ductwork connections to equipment where indicated on the drawings.

G. Install ductwork in all spaces as high as possible and in locations to avoid interference with recessed lights, piping, general construction, etc.

H. Install round ducts in maximum practical lengths.

I. Install ducts with fewest possible joints.

J. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

K. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

L. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

M. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

N. Route ducts to avoid passing through transformer vaults, electrical equipment rooms and enclosures, and stairwells.

O. 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.

P. Where ducts pass through fire-rated interior partitions and exterior walls, install fire or combination fire-smoke dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

Q. Where duct passes through exterior walls and roofs from interior to exterior, provide water and airtight penetration detailing as required, preserving the thermal, moisture, and vapor penetration resistance of the surrounding assembly.

R. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.4 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 and surrounding heat affected zone 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.

3.5 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped up from hood to outlet or down from high point to a grease reservoir as specified, a minimum of 1:48 (2 percent) for horizontal runs up to 75 feet and 1:12 (8.3percent) for runs above 75 feet. Where continuous slope up is not possible,

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.6 DUCT SEALING

A. Make system air tight / water tight as required and approved, replacing any poor joints or careless work. Fabricate ductwork to the following SMACNA leakage standards:

1. Seal Class A - Greater than 2 inch w.g. and for air and water tight ductwork described below.
2. Seal Class B – 2 inch w.g. and less general supply, return, and exhaust ductwork.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with the requirements of the following:

1. SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
2. Section 23 05 29 “Hangers And Supports for HVAC Components”.
3. Section 23 05 43 “Mechanical Vibration and Motion Control”.
4. Section 23 05 48 “Mechanical Wind Load Control”.

B. Comply with the additional requirements below:

1. SMACNA load tables do not provide for external loads on duct: provide for 200 lb external load on all duct hangers and supports. Increase hanger and support sizes from SMACNA tables accordingly:

   a. Minimum band size 20ga. x 1 inch.

   b. Duct 48” wide and larger; provide trapeze style support of metal channel framing or angle iron, suspended from threaded rods.

   c. Hanger bands to extend down sides and turn under bottom 1 inch minimum for all duct sizes. Minimum (2) #10 sheet metal screws per hanger (one each on side and bottom), (2) screws minimum on sides for duct over 12 inches tall, 12 inches on center max.

2. Hangers Exposed to View:

   a. Rectangular duct: threaded rod and angle or channel supports.
   b. Round duct: twin half round bands 14 ga min., and threaded rods.

3. Provide hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

4. 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. Do not allow flexible duct to rest on general construction. Support flexible duct at maximum 3 feet on center.

3.8 CONNECTIONS

A. Make connections at all intake and discharge connections between duct and vibration producing equipment with fans where duct passes through building expansion joints, and as shown on the drawings, with flexible connectors as specified.

1. Round connections: Adhesive and approved metal draw bands; ends tightly bolted together.

2. Rectangular flanges: Material securely held in grooved seam, tightly clipped or screwed on 6 inch centers.

3. Connections not over 2 inch between duct and equipment, with at least 1 inch excess material.

4. Install neatly so as not to interfere with air flow through connection. Provide round metal center ring or rectangular metal center collar to prevent flex fabric collapse inside of nominal connected duct dimensions.

5. Provide complete electrical continuity of duct systems to ground, bridging all flexible duct connectors and other non-conductive duct with grounding jumpers as described in section 26 05 26 “Grounding and Bonding of Electrical Systems”.

B. Registers, Diffusers, and Grilles:

1. Install flexible duct connections to registers, diffusers, and grilles with no more than 20 degree unsupported bend in flex. Where horizontal duct connects to vertical axis collar (ex., ceiling mounted diffuser), provide elbow support as specified or hard elbow.

   a. Where flexible duct is not electrically continuous between metallic duct and Register, Grille, or Diffuser as specified in section 26-05-26 “Grounding and Bonding of Electrical Systems”, provide with grounding conductor or jumper as specified, maintaining continuity between RGD and ductwork.

2. Exposed, duct side mounted: Mount outlet outside of air stream with extension collars full size of register or grille frame outside margin, with turned in duct flange and turned out terminal mounting flange. Provide vaned air extractor with internal mechanism / external rotating knob adjuster.

3. Exposed ductwork hard piped connections: per Duct Manual.

3.9 FIELD QUALITY CONTROL

A. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.

2. Test the following systems:

    a. All duct specified as water tight including but not limited to all exterior duct and all type 1 and type 2 kitchen hood exhaust duct.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

4. Test for leaks before applying external insulation.

5. Prior to the use or concealment of any portion of a grease duct system including all Type 1 and Type 2 kitchen hood exhaust systems provided or modified in this project, perform a Grease Duct Leakage Test. Concealment includes installation of shaft walls, hard ceilings, and other fixed architectural elements around duct as well as covered by insulation, coatings, or wraps that prevent the ductwork from being visually inspected on all sides. Provide all labor and equipment required to perform a light test to determine that all joints are liquid tight.

    a. Grease Duct Leakage Test: pass a lamp having a light output rating of not less than 1500 lumens total nor less than 1000 lumens per foot through the entire section of ductwork to be tested. Provide an open lamp that emits light equally in all directions radially from the nominal duct centerline. Darken space duct is installed in to increase visibility of any leaked light, and visually inspect entire circumference of duct for leaked light, section by section, paying special attention to joints and weld pin locations. Between sections, move point source lights similar in size to an incandescent light bulb no more than three feet, and move linear lights similar to fluorescent tubes no more than the bulb length plus two feet. Mark any leak locations on duct, repair after test, and re-perform light test until no light leaks remain. Perform test for the entire duct system affected by the project, including the hood-to-duct connection and all points through the fan to the exterior. Test the ductwork in sections, provided that every joint provided or modified by this project is tested. For listed factory-built grease ducts, testing may be limited to duct joints assembled in the field, excluding factory welds.

6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.

7. Give seven days' advance notice for testing.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

C. Electrical Bonding Continuity Testing: Test each entire Ductwork and Ductwork Accessories system for ground bonding continuity in accordance with section 26 05 26 “Grounding and Bonding of Electrical Systems”. Include test report demonstrating approvable bonding as part of commissioning and closeout documentation.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.10 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.

2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.

3. Remove and reinstall ceiling to gain access during the cleaning process.

C. 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.

D. 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. 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.

4. Provide drainage and cleanup for wash-down procedures.

3.11 START UP

A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

END OF SECTION 23 31 00

SECTION 23 33 00 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire Dampers, Smoke Dampers, and Combination Fire and Smoke Dampers.
2. Auxiliary Condensate Control.

1.3 PERFORMANCE REQUIREMENTS

A. Provide Ductwork Accessories in compliance with all applicable requirements of Section 23 31 00 “Ductwork” and appropriate design and construction manuals issued by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

B. Fire, Smoke and Fire/Smoke Dampers: Provide dampers listed for the application in locations shown on Drawings or specified in this Section including all new ducts penetrating fire rated general construction and in accordance with NFPA 90A maintaining the fire rated integrity of the general construction.

C. Auxiliary Condensate Control: Provide as required to protect building components from condensate overflow where manufacturers’ condensate control system does not provide for auxiliary protection.

1.4 ACTION SUBMITTALS

A. Product Data: For all Ductwork Accessories, as required demonstrating compliance with specified requirements.

B. Shop Drawings: For all Ductwork Accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail Ductwork 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. Additionally include the following as required for specific applications:

a. Fire-damper, smoke-damper, combination fire- and smoke-damper installations: include sleeves, duct-mounted access door locations, and motorized damper operators.

b. Exhaust Hoods: include sub-frame mounting requirements and adjustment mechanisms.

c. Machinery Safety Guards: include detailed operating and service clearance dimensions.

d. Auxiliary Condensate Control: include dimensions of equipment served, clearance to general construction, and service access.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Ductwork Shop and Coordination Drawings: Include Ductwork Accessories in Ductwork Shop Drawings and Ductwork Coordination Drawings, only after approval of ductwork accessories submittals detailed in this section. Refer to Section 23 31 00 “Ductwork” for details.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Comply with all applicable codes and as follows.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

C. Fire, Smoke, and Combination Fire – Smoke Dampers: Rated, listed, and labeled according to UL 555 and UL 555S by an NRTL.

D. Kitchen Hood Service: Comply with NFPA 96 “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations” and UL 710 “Standard for Safety Exhaust Hoods for Commercial Cooking Equipment”.

E. Comply with AMCA 500-D testing for damper rating.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish the larger of 10 percent of amount installed, or minimum 3.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General Material Requirements:

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated.

2. Provide sheet metals per mill specs and free of pits, voids, seam or roller marks, stains, discolorations, inadvertent bends and kinks, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M, G90 coating designation, lock forming quality, unless otherwise specified..

1. Exposed to view, not externally insulated or painted: Galvannealed steel.

2. Exposed to view, to be painted: Galvannealed steel prepared for painting via mill phosphatizing and subsequent heat treatment in accordance with ASTM D6386 and ASTM D7803 as applicable

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304L or 316L Stainless-Steel Sheets; cold rolled, annealed. Minimum surface finish for concealed duct No. 2B exterior of duct, No. 2D interior of duct. Minimum surface finish for duct exposed to view in occupied spaces, No. 4 polish.

D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

2.2 CONTROL DAMPERS

A. Refer to Section 23 09 00 “Instrumentation and Control for HVAC” for control damper specifications.

2.3 FIRE DAMPERS

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. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Metal-Fab Inc.
6. Nailor Industries Inc.
7. NCA Manufacturing, Inc.
8. Prefco; Perfect Air Control, Inc.
9. Ruskin Company.

10. Vent Products Company, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Provide curtain-blade or multi-blade dampers as required by size and application.

C. Type: Dynamic rated and labeled according to UL 555 and/or UL 555S by an NRTL.

1. Rated for ducts up to 4-inch wg static pressure class and 4000-fpm velocity.
2. Mounting Orientation: Vertical or horizontal as required by application.
3. Include blade lock and stainless-steel closure spring sufficient for Mounting Orientation.

D. Fire Rating: 1-1/2 or 3 hours as required; refer to drawings for fire rating of general construction.

E. Frame: Fabricated with roll-formed, 0.034-inch- thick galvanized or stainless steel; with mitered and interlocking corners. Provide frame Type "C" unless otherwise specified or shown on drawings and materials as specified and detailed in Part 3 - Execution.

1. Type "C": 100% free area curtain style with frame and retracted blades outside airstream.

2. For dampers shown or required by general construction conflicts to be installed with damper blades outside of the plane of the fire resistive general construction, provide factory assembly UL listed for this installation including extended reinforced sleeve factory covered with fire rated insulation meeting or exceeding the rating of the surrounding general construction.

F. Mounting Sleeve: Factory- or field-installed, same steel as frame.

1. Minimum Thickness: equal to the thicker of the attached duct material, 0.052 inches, or as required by product listing, and of length to suit the associated wall or floor construction.

2. Provide with (4) 1-1/2 inch X 1-1/2 inch, 14 gauge galvanized steel mounting angles to be field attached to the sleeve only.

3. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Blades: Roll-formed, interlocking, 0.034 inch thick sheet steel of same type as frame. In place of interlocking blades, use full-length steel blade connectors.

H. Heat-Responsive Device: Replaceable fusible links rated for 165 deg F or other temperature where noted on drawings.

2.4 SMOKE DAMPERS AND COMBINATION FIRE AND SMOKE DAMPERS

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. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.

4. Nailor Industries Inc.
5. Ruskin Company.

B. Type: Listed and labeled according to UL 555 and UL 555S by an NRTL for pressure and velocity to exceed design airflow conditions for dynamic closure in ducts up to 4-inch wg. static pressure class and minimum 2000 fpm velocity.

C. Fire Rating of dampers designated as combination Fire-Smoke Dampers 1-1/2 hours as required; refer to drawings for fire rating of general construction:

D. Heat-Responsive Device of dampers designated as combination Fire-Smoke Dampers: Factory installed electric resettable link and switch package, rated for 165 deg F.

E. Corrosion resistance: Galvanized steel for use in galvanized steel ductwork, stainless steel for use in aluminum or stainless steel ductwork.

F. Frame: Multiple-blade type with frame outside of airstream; fabricated with roll-formed, 0.060-inch- thick steel; with mitered and interlocking corners.

G. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- thick sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick steel blade connectors.

H. Leakage: Class I.

I. Mounting Sleeve: Factory-installed, 0.052-inch- thick sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

1. For fire rated dampers shown or required by general construction conflicts to be installed with damper blades outside of the plane of the fire resistive general construction, provide factory assembly UL listed for this installation including extended reinforced sleeve factory covered with fire rated insulation meeting or exceeding the rating of the surrounding general construction.

J. Damper Actuator Motors:

1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 19 “Common Electrical Requirements for HVAC Components”.

2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 23 09 00 “Instrumentation and Control for HVAC” and Section 28 31 11 “Digital, Addressable Fire-Alarm and Mass Notification System”.

3. Coordinate electrical voltage, connections, and signaling characteristics with facility fire alarm system, typically 115 v, single phase, 60 Hz.

4. Motor Sizes: As required for the UL listing.

5. Provide with two-position action.

6. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed metal gear trains.

7. Spring-Return Motors: Equip with an integral spiral-spring mechanism. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running and breakaway torque rating of 150 in-lbf or as required by damper size and listing.

K. Accessories:

1. Auxiliary end switches for position indication.
2. Test and reset switches.
3. Integral smoke detector, factory wired and installed in duct sleeve.
4. Control panel integrating Smoke and Fire-Smoke Dampers for testing and monitoring use in smoke-management systems.

2.5 AUXILIARY CONDENSATE DRAIN SYSTEM

A. Provide a secondary drain or auxiliary drain pan for each cooling or evaporator coil where damage to any building component will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping. Provide one of the following:

1. Provide an auxiliary drain pan with the following characteristics underneath coils where condensation will occur:

a. Galvanized steel, minimum depth 1-1/2 inches, not less than 3 inches larger each horizontal direction than the unit or coil dimension it serves. Pitch drain pan to direction of discharge; provide a separate overflow drain line to discharge at point indicated, or to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain.

2. Provide a separate overflow drain line connected to the drain pan provided with the equipment. Discharge overflow drain at an approved conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. Connect the overflow drain line to the drain pan at a higher level than the primary drain connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where air terminal units are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories with stainless steel fire and fire-smoke dampers in aluminum ducts.

C. Install fire and smoke dampers according to UL listing and in compliance with the latest edition of NFPA 90A.

1. Provide for adequate perimeter clearance and fire rated flexible infill as required, in accordance with the manufacturers instructions and so as to not cause interference with the operation of the damper due to restricted thermal expansion.

2. Provide Type C frame dampers, or, increase damper size in each dimension by an amount such that the free opening is the specified duct size minimum, and provide duct transitions on either side. Example: 12" x 20" duct with Type A 7/8 inch frame and nominal damper size 1/4 inch less than listed duct with blades protruding 3 inches into duct - use 17" x 20" Type A damper.

3. For all fire and fire/smoke dampers installed in duct, plenum casing, or other building construction openings which must be fire rated, with nominal cross section dimensions in width or height greater than the manufacturer’s maximum available dimensions, provide multiple dampers and all interceding support structure as required to fabricate a U.L. listed fire damper assembly of the required free area cross section.

4. Provide access door(s) in duct and building construction where required for access for each damper in suitable locations to permit reasonable access to and resetting of the damper blades. Demonstrate access and resetting of thermal linkage during commissioning.

D. Install Auxiliary Condensate Drain Systems where required. Adjust to be level / properly sloped under empty and fully loaded condition. Connect to properly piped gravity condensate drain piped to point of approved discharge.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate all dampers to verify full range of movement.
2. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
3. Demonstrate proper service access at all dampers.
4. Inspect installation of all Auxiliary Condensate Drain Systems and demonstrate they perform their intended function

END OF SECTION 23 33 00

SECTION 23 34 00 - HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.
2. Ceiling-mounted ventilators.
3. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.
B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.
B. Review approved kitchen fan submittal as described in Div. 11 sections in preparation for the installation.

1.5 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.

1.6 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. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.7 CLOSEOUT SUBMITTALS

A. Field quality-control reports.
B. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

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 commercial 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 roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 ROOFTOP CENTRIFUGAL EXHAUST FANS

A. Unit Description: UL listed exhaust fan specifically designed for outdoor installation and service, shipped fully assembled and factory tested prior to shipment.

1. Housing:

a. Spun 16 gauge minimum weather tight marine grade aluminum two piece upper housing, with reinforced rolled edges. Down-blast, or up-blast housing as scheduled.

1) Fully welded aluminum curb cap

b. Rubber grommeted internal wiring passages unless otherwise specified.

c. Provide aluminum nameplate riveted to housing exterior with manufacturer, model, cfm, static pressure, and electrical characteristics all permanently engraved or stamped.

2. Impellers: Backward inclined, non-overloading, statically and dynamically balanced all aluminum construction, including hubs. Impeller shall overlap a spun aerodynamic inlet cone. Belt or direct drive as shown on Drawings.

3. Power Assemblies:

a. Motor and drive isolated from discharge air stream in forced-air cooled compartment.

b. Power Assembly mounted on minimum 14 gauge plated steel structure, supported on housing with rubber isolators loaded in combination shear and compression.

c. Motors:

1) Refer to section 23 05 13 ”Common Electrical requirements for HVAC Components” for additional information.

2) Constant Speed Operation: Open drip-proof type with sealed, permanently lubricated ball bearings; pre-wired through to disconnect switch mounted under fan cover with sufficient legs to break all leads to motor.

a) Motors, wiring, and disconnects serving fume hood exhaust fans and other potentially flammable exhaust streams shall be UL listed and in accordance with NEC for explosion proof construction.

4. Accessories / options as scheduled:

    a. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
    b. Bird Screen: Removable, 1/2-inch mesh, aluminum or brass wire.
    c. Manual Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

B. Manufacturers: Cook, Greenheck, Penn Ventilator, Twin Cities, or Approved Equal.

2.2 CEILING-MOUNTED VENTILATORS

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. Breidert Air Products.
2. Carnes Company.
3. Greenheck Fan Corporation.
4. Loren Cook Company.
5. PennBarry.

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: High-impact styrene, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing.

F. Accessories:

1. Fan speed controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Rubber in shear mounting bracket.
3. Disconnect switch.
4. Integral back draft damper.

2.3 IN-LINE CENTRIFUGAL FANS

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. Acme Engineering & Manufacturing Corporation.
2. Breidert Air Products.
3. Carnes Company.
4. Greenheck Fan Corporation.
5. Hartzell Fan Incorporated.

6. Loren Cook Company.
7. PennBarry.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

E. 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. Vibration Isolators: Elastormeric

2.4 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Electrical Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

B. Enclosure Type: Totally enclosed, fan cooled.

2.5 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install kitchen hood exhaust fan furnished under Division 11.

B. Install power ventilators level and plumb.

C. Support units as described herein having a static deflection of 1 inch. Vibration-control devices are specified in Section 23 05 43 "Mechanical Vibration and Movement Control".

D. Secure roof-mounted fans to roof curbs with stainless steel hardware. Anchor equipment to roof curb with fasteners located 12" on center with a minimum of two fasteners on each side.

E. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

F. Support suspended units from structure using threaded steel rods and vibration hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 23 05 43 "Mechanical Vibration and Movement Control".

G. Install units with clearances for service and maintenance.

H. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.3 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Ductwork."

B. Install ducts adjacent to power ventilators 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."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. 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. 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. Verify lubrication for bearings and other moving parts.

6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

7. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.

8. Shut unit down and reconnect automatic temperature-control operators.

9. 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.

3.5 ADJUSTING

A. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

END OF SECTION 23 34 00

SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bypass, single-duct air terminal units.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: 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".

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.

B. Shop Drawings: For air terminal units. 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.

3. Hangers and supports, including methods for duct and building attachment.

1.6 INFORMATIONAL SUBMITTALS

A. 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. Size and location of initial access modules for acoustic tile.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.7 CLOSEOUT SUBMITTALS

A. Field quality-control reports.

B. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

PART 2 - PRODUCTS

2.1 SINGLE-DUCT AIR TERMINAL UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Carnes.
2. Carrier Corporation.
3. Titus.

B. Configuration: Diverting-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: Single wall.

1. Casing Lining: Adhesive attached, ½ inch thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.

   a. Cover liner with nonporous foil.
   b. Cover liner with nonporous foil and perforated metal.

2. Air Inlet: Round stub connection for duct attachment.

3. Air Outlet: S-slip and drive connections.

4. Access: Removable panels for access to diverting damper and other parts requiring service, adjustment, or maintenance; with airtight gasket.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

D. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

E. Electronic Controls: Bidirectional damper operator and microprocessor-based thermostat. Control devices shall be compatible with temperature controls specified in Division 23 Section "Instrumentation and Control for HVAC" and shall have the following features:

1. Furnish with 24v control transformer.

2.2 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to AHRI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type and AHRI certification seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where air terminal units are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
B. Building Attachments: In conformance with 23 05 23 Hangers and Supports for HVAC Components.

3.4 CONNECTIONS

A. Install piping adjacent to air terminal unit to allow service and maintenance.

B. Hot-Water Piping: In addition to requirements in Division 23 Section "Hydronic Piping," connect heating coils with shutoff valve, control valve, and union or flange, balancing valve and union or flange.

C. Connect ducts to air terminal units according to Division 23 Section "Ductwork." Coordinate duct installations and specialty arrangements with Drawings.

D. Make connections to air terminal units with flexible connectors complying with requirements in Division 23 Section "Ductwork."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Air terminal unit will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 23 36 00

SECTION 23 37 00 – AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior Outlets and Inlets:

   a. Registers, grilles, and diffusers

2. Exterior Outlets and inlets:

   a. Air louvers
   b. Roof Top hoods

1.3 SYSTEM DESCRIPTION

A. Design Requirements

1. Registers, Grilles, and Diffusers: Provide all supply, return and exhaust grilles, registers, and diffusers required for all systems.

2. Air Louvers: Provide AMCA-rated louvers for all fresh air intake and exhaust openings, except as otherwise shown or specified in Contract Documents. Cross- reference dimensions of each louver shown on heating drawings with those on the architectural drawings. Notify architect in writing of any discrepancies prior to submitting on louvers.

3. Roof Top Hoods : Provide fresh air intake and exhaust / relief openings, as shown or specified in Contract Documents. Cross- reference dimensions of each hood shown on heating drawings with those on the architectural drawings. Notify architect in writing of any discrepancies prior to submitting on equipment.

1.4 PERFORMANCE REQUIREMENTS

A. Interior Outlets and Inlets: Provide outlets and inlets with aspiration ability, temperature mixing, and velocity traverses and decay with distance, throw, pressure drop, and noise criteria ratings equal to or better than specified products.

B. Exterior Outlets and Inlets Delegated Design: Include comprehensive engineering analysis by a qualified professional engineer, using wind, snow, gravity, and seismic loading criteria as indicated on the code compliance drawings. Factory standard certifications are acceptable for factory standard products; custom certification is required for custom products.

1. Components shall withstand the effects of the specified loads within limits and under conditions indicated without permanent deformation, noise or metal fatigue caused by vibrations or permanent damage to fasteners and anchors.

2. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

3. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

1.5 SUBMITTALS

A. Comply with requirements of SECTION 01 33 00 “Submittal Procedures” and as modified below.

B. Product Data: Submit manufacturer’s product literature, technical specifications, performance data, installation instructions, and similar information required to demonstrate compliance with specified requirements. Annotate all selected options, cross referenced to specification and drawing designations. Include tabulated data for all proposed outlets and inlets, showing size, type, cfm, aspiration ability, water entrainment, temperature mixing, and velocity traverses and decay with distance, throw, pressure drop, noise criteria ratings and any other applicable data demonstrating performance equal to or better than specified products.

C. Shop Drawings: Submit shop drawings showing sizes, construction details, mounting details, capacity, and air flow characteristics for all equipment. Include complete tabulated schedules as indicated below for each of RGD, Louvers, and roof Top Hoods.

1. Registers, Grilles, and Diffusers (RGD): Include complete tabulated schedule showing locations for each RGD, type, size, capacity as shown on Drawings, and performance data for each RGD furnished, including throw and noise criteria ratings. Indicate selections on data.

2. Air Louvers, and Roof Top Hoods: Include complete tabulated schedule showing locations for each Louver, and Roof Top Hood showing type, size, wall and/or roof rough opening size, capacity as shown on Drawings, and performance data for each including pressure drop and water entrainment specifications. Include all this data on coordination drawings and special Mechanical Penetrations of General Construction Envelope coordination drawing.

D. Contract Closeout Submittals: Comply with requirements of SECTION 01 77 00, including submission of operating and maintenance instructions as item in "Operating and Maintenance Data" manual described in that section.

1.6 SEQUENCING AND SCHEDULING

A. Deliver Exterior Outlets and Inlets to project in sufficient time for installation in walls as wall construction progresses.

1. Coordinate unit selection to meet requirements of other equipment and installation details (automatic dampers, back draft dampers, etc.).
2. Verify all opening sizes, locations and mounting arrangements prior to installation.

PART 2 - PRODUCTS

2.1 REGISTERS, GRILLES, AND DIFFUSERS

A. General

1. Provide registers, grilles, and diffusers with border systems that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into ceiling modules with accurate fit and adequate support. Refer to general construction drawings and specifications for details of adjacent systems.

2. All performance criteria equal to or better than design make as specified and tagged on drawings.

3. Provide factory baked white enamel finish for steel materials and clear or color anodizing for aluminum material as base bid standard finish unless otherwise specified or noted.

4. Provide products by one of the following:

a. Krueger or equal.
b. Price or equal.
c. Anemostat or equal.

B. Registers:

1. TYPE "R-B": Double deflection wall supply register; vertical front and horizontal rear vanes with 3/4" spacing between blades, rubber gasket to prevent streaking, vanes individually adjustable; steel construction. Similar to Krueger “880V” or “880H (horizontal front)”.

C. Grilles

1. TYPE "G-A": Eggcrate return grille; 1/2 inch x1/2 inch x1inch deep squares; fabricated aluminum core; flat frame; white baked enamel finish to match ceiling. Neck size and accessories as noted on drawings. Provide frame to fit lay-in ceiling grid or hard ceiling as required. Similar to Krueger “EGC-15”.

D. Supply Diffusers:

1. TYPE "D-A": Architectural round plaque ceiling diffusers, of the sizes and mounting types shown on the plans. Round outer cone shall be constructed of 18-gauge steel and heavy gauge aluminum plaque face. The exposed surface of the plaque shall be smooth and flat. The airflow discharge pattern shall be field adjusted from horizontal to vertical by repositioning the plaque assembly using the adjusting screws. The plaque assembly shall be constructed as a single inner assembly and must be easily removable using a spring lock mechanism. Provide with retainer cable. The finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315ºF for 30 minutes. Design basis: Titus R-Omni or Engineer approved equal.

E. AIR LOUVERS

1. Exhaust Louvers (Fixed Type)

a. Minimum 39% free area.
b. 4” deep standard frame
c. Continuous weepage at bottom, high rear water stop.
d. Extruded aluminum construction.
e. Clear anodized.
f. Design Basis: Ruskin BV100 or Engineer approved equal.

2.2 ROOF TOP HOODS

A. Dome Style Roof Top Hoods:

1. Rated for snow and wind load shown on Code Compliance Drawings.

2. Designed for intake or exhaust (relief), as shown on the drawings.

a. Intake hoods shall have minimum free area at inlet equal to twice the throat cross section.
b. Exhaust hoods shall have minimum free area at outlet equal to the throat cross section.
c. Provide closed cell insulation adhered to underside of exhaust /relief hoods to prevent condensation.

3. Heavy gauge (0.060 inch) aluminum construction.

4. All vertical seams continuously welded. Tops stressed and sloped for drainage with standing lock-formed seams; slope by cross breaking only of flat top not acceptable. All mechanical fasteners stainless steel.

5. Provide hinged joint between hood and base for ease of service access.

6. Provide 1/2 inch aluminum bird screen, secured in removable frame to underside of opening.

7. Curb: Install units on minimum 14" insulated curb or higher curb as scheduled; factory fabricated similar to Pate "Model PC-5A".

8. Size and capacity as shown on the drawings.

    a. Provide scheduled factory finish as detailed below:

        1) Standard mill finish.

9. Provide products by one of the following:

    a. Cook "G" series or equal.
    b. Greenheck "Fabra Hood" or equal.
    c. Twin City Fans and Blowers, "MG" series or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which air outlets and inlets are to be installed and notify a Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. Air Louvers: Coordinate unit selection to meet other equipment and installation details (automatic dampers, back draft dampers, etc.). Verify all opening sizes, locations and mounting arrangements prior to installation.

3.2 INSTALLATION

A. Install air outlets and inlets in strict accordance with manufacturer's recommended installation instructions for applications shown on Drawings.

B. Registers, Grilles and Diffusers (RGD): Install all RGDs in accordance with manufacturer's installation instructions and SMACNA installation manual at locations indicated on Drawings.

1. Adjust each type of RGD as required to achieve even air distribution throughout occupied space, generally free of objectionable drafts and dead air pockets. Demonstrate adjustments of distribution to Owner and additionally adjust as requested by Owner's representative during or subsequent to initial adjustments. As RGD adjustment and Testing and Air Balancing work affect each other, make preliminary adjustment to all RGDs prior to balancing, and make final RGD adjustment during TAB work in cooperation with TAB agency. Refer to section 23 05 93 "Testing Adjusting and Balancing for HVAC" for more detail.

2. Provide final balancing in accordance with SECTION 23 05 93.

3. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that requires them.

C. Air Louvers: Comply with manufacturer's specifications and recommendations for assembly and installation of air louver units, hardware, operators, and other components.

1. Set units plumb, level, and true to line, without warp or rack of frames. Anchor securely in place. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials. Use stainless steel fasteners.

2. Set head, jamb, and sill members in bed of compound as shown, or with joint fillers or gaskets as shown to provide weather tight construction.

3. Provide suitable gaskets or coating where dissimilar metals are in contact.

4. Clean aluminum surfaces promptly after installation of units. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

D. Roof-Mounted Hoods

1. Provide roof curbs in sufficient time to coordinate with construction schedule.

2. Verify all opening sizes, locations, and mounting arrangements prior to installation. Provide structural support frame around all roof deck penetrations 12 inches x 12 inches and larger, unless specifically indicated otherwise elsewhere on the Contract Documents.

3. Comply with applicable requirements of SECTION 23 05 29 “Hangers and Supports for HVAC Components”.

4. Comply with manufacturer’s requirements for securing to curbs. Use appropriate weatherproof gasketing and stainless steel fasteners as required meeting loading requirements specified above.

END OF SECTION 23 37 00

SECTION 23 62 13 – UNITARY AIR CONDITIONING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Split System Air Conditioners with Remote Condensing Units.

B. Products Furnished but not Installed Under this Section.

1. Associated refrigerant piping and condensate drain piping.

1.3 SYSTEM DESCRIPTION

A. Design Requirements

1. Cooling performance rated in accordance with AHRI Testing.

2. Unit efficiencies meet scheduled performance and exceed Energy Code Requirements.

3. Units listed and labeled by UL and ETL.

4. Provide all refrigeration equipment and related installation in compliance with the latest editions of the Mechanical Code of NYS chapter 11, the safety code for mechanical refrigeration ASHRAE Standard 15, and ANSI Refrigeration Safety Code B 9.1.

1.4 SUBMITTALS

A. Comply with requirements of Section 01 33 00 “Submittal Procedures” and as modified below.

B. Product Data: Provide manufacturer's specification data for each unit, showing operating weight, all sizes, dimensions, capacity, operating and performance characteristics, motor horsepower, and other pertinent data including color chart.

C. Contract Closeout Submittals: Comply with requirements of Section 01 77 00, including submission of operating and maintenance instructions as item in "Operating and Maintenance Data" manual described in that section.

PART 2 - PRODUCTS

2.1 DUCTLESS SPLIT COOLING ONLY OR HEAT/COOL AIR CONDITIONING UNIT

A. Unit Description: Unit bearing AHRI Certification Symbol and listed by ETL Testing Laboratories, Inc. consisting of outdoor unit which contains refrigerant compressor and can provide cooling only or heating and cooling of spaces, indoor unit connected by insulated copper refrigerant tubing with flare type fittings. System equipped with factory-installed solid core filter drier, large capacity suction accumulator, low ambient controls, and other accessories as specified and as scheduled.

1. Cooling only units similar to ductless heat/cool heat pump units without capability for reversing heat flow – ie., no reversing valve and associated controls.

2. Refrigerant Run Capability: 130 feet of lift with maximum tubing length of 130 feet of interconnecting piping for up to 1.5 ton capacity unit, and 50 feet of lift with maximum tubing length of 164 feet for unit with greater than 1.5 ton capacity up to 3.5 ton capacity.

3. Refer to drawings for capacities and performance ratings.

B. Refrigerant: Sufficient R454B refrigerant provided in outdoor unit to charge complete system.

C. Outdoor Condensing Unit: Outdoor with inverter driven variable speed compressors which provides efficient cooling and heating performance.

1. General data:

a. Factory assembled and pre-wired with all necessary electronic and refrigerant controls.

b. Refrigeration circuit consisting of a digital scroll compressor, motors, fans, condenser coil, electronic expansion valve, solenoid valves, 4 way valve, distribution headers, capillaries, filters, service isolation valves, oil separators, service ports, liquid receivers and accumulators.

c. Both liquid and suction lines must be individually insulated between the outdoor and indoor units on heat pump units. Liquid line insulation is not required on cooling only units.

d. The outdoor unit can be wired and piped with outdoor unit access from left, right, rear or bottom.

e. The sound pressure at rated conditions: maximum of 58 decibels dB(A) at 3 feet from the front of the unit. Provide with night operation mode capable of operating at further reduced noise.

f. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for re-programming.

g. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.

h. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers, and sub-cooling feature. Oil recovery cycle shall be automatic occurring 1 hour after start of operation and then every 6 hours of operation.

i. The outdoor unit shall be capable of full heat pump heating operation at 0°F dry bulb ambient temperature without additional low ambient controls. Provide for 100% heat pump heating capacity down to minus 4 deg F, with partial capacity heat pump operation down to no greater than minus 13 deg F.

2. Unit Cabinet:

a. The outdoor unit shall be completely weather proof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

3. Fan:

a. The outdoor unit shall consist of one or two propeller type, direct-drive fan motors that have multiple speed operation via a DC inverter.
b. The outdoor unit fan motor shall have multiple speed operation of the DC inverter type, controlled to modulate as required to maintain head pressure.
c. The fan motor shall have internal thermal overload protection and permanently lubricated bearings and be mounted on rubber in shear isolators.
d. Provide a fan guard to prevent contact with moving parts, constructed of welded wire and plated or painted for corrosion resistance.

4. Outdoor Coil:

a. Manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
b. The coil shall be of a waffle louver fin and high heat exchanger, rifled bore tube design to ensure highly efficient performance.
c. The coils shall be complete with corrosion treatment of an acrylic resin type. The thickness of the coating must be between 2.0 to 3.0 microns.

5. Compressor:

a. The scroll compressor shall be variable speed (PWM inverter) controlled, changing speed to follow the variations in total cooling load as determined by the suction gas pressure as measured in the condensing unit.

b. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC, hermetically sealed scroll type with a maximum speed of 6,480 rpm.

c. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.

d. The capacity control range shall be modulating from 14% to 100%.

e. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.

f. Oil separators shall be standard with the equipment together with an oil balancing circuit.

g. The compressor shall be mounted to avoid the transmission of vibration.

6. Electrical:

a. The power supply to the outdoor unit shall be in voltage and phasing as shown on the drawings, with a tolerance of +/- 10% from nominal indicated.

b. The control voltage between the indoor and outdoor unit shall be low voltage control wiring compatible with the energy management and control system as specified in section 23 09 00. The control wiring shall be a multiplex communication system, making it possible to connect multiple indoor units to one outdoor unit with one cable, thus simplifying the wiring operation.

D. Indoor Unit – Ceiling Cassette Unit

1. General: The indoor unit model shall be a ceiling cassette fan coil unit, operable with scheduled refrigerant, for installation into the ceiling cavity with an air panel grille. It shall be a four-way air distribution type, ivory white, impact resistant, and washable decoration panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized control shall be used to maintain room temperature within 1°F. The indoor units sound pressure shall range from 28 dB(A) to 33 dB(A) at low speed measured at 5 feet below the unit.

2. Indoor Unit:

a. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

b. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

c. Both refrigerant lines shall be insulated from the outdoor unit.

d. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.

e. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.

f. Indoor units shall be capable of accepting outside air delivered though sidewall knock-outs sized for acceptance of scheduled outside air flow rates.

g. The indoor units shall be equipped with an insulated corrosion proof condensate pan under the coil capturing and controlling all condensate.

h. Provide a condensate pump with a 21 inch lift located below the coil in the condensate pan, complete with a built in safety high level alarm and interlock.

i. The indoor units shall be equipped with a return air thermistor.

j. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

k. The voltage range will be 253 volts maximum and 187 volts minimum.

3. Unit Cabinet:

a. The cabinet shall be space saving and shall be located into the ceiling.
b. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
c. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
d. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

4. Fan:

a. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
b. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.06 to 0.12 HP.
c. The air flow rate shall be available in high and low settings.
d. The fan motor shall be thermally protected.

5. Filter:

a. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

6. Coil:

a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
c. The coil shall be a 2 row evaporator coil completely factory tested.
d. A thermistor will be located on the liquid and gas line.

7. Electrical:

    a. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
    b. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
    c. Transmission (control) wiring between the indoor and remote controller shall be a maximum distance of 1,640 feet.

8. Control:

    a. The unit shall have controls provided to perform input functions necessary to operate the system.
    b. The unit shall be compatible with interfacing with connection to LonWorks networks or interfacing with connection to BMS system.

E. Controls:

1. Provide intelligent touch controller to control entire system. Provide gateway to seamlessly interface with EMCS.
2. Provide Simplified wired remote controller for each space. All room controllers to wire to intelligent touch controller which can be monitored at the OWS.

F. Manufacturers:

1. Basis of design is as scheduled on the drawings.

2. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carrier / Toshiba.
    b. Daikin.
    c. Sanyo.
    d. Trane / Mitsubishi.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which unitary air conditioning equipment is to be installed and notify affected Contractors and Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. When conditions are confirmed to be acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable.

3.2 INSTALLATION

A. Install in strict accordance with manufacturer's recommendations and as follows.

1. Provide combination equipment / piping curb in proper position on roof, secured and leveled as recommended by manufacturer. Provide sufficient portals in pipe penetration portion of curb for refrigerant, electrical power, and control wiring.

B. Provide all required supports, attachment devices, vibration isolators, gasketing, sealants, and accessories needed to insure stable, quiet, leak free operation.

C. Provide all refrigerant piping in strict accordance with section 23 23 00 "Refrigerant Piping".

D. Run insulated condensate drain line to approved point of indirect waste disposal through properly sized P-trap. Pitch drain line continuously in direction of flow. If gravity drain is not possible, provide condensate removal pump as specified, piped to nearest approved point of indirect waste disposal.

3.3 FACTORY START UP AND FIELD QUALITY CONTROL

A. Provide authorized factory representative to start-up unit, check following items, and furnish report:

1. Measure and check voltage of components.
2. Check removal of shipping bracing.
3. Proper connection of drains.
4. Check control circuitry, operation, and performance during all modes of operation.
5. Fan check (RPM, motor amps, rotation, belt tension, etc.).
6. All wiring circuits.
7. All accessory equipment operation, such as filters, controls, condensate drain, etc.

END OF SECTION 23 62 13

SECTION 23 72 00 - AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Packaged energy recovery units.

1.3 PERFORMANCE REQUIREMENTS

A. No condensate shall form anywhere on or around the complete unit that is not controlled by condensate pans and directed to drain though condensate piping provided as a part of this Contract.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Product Data: For each type or model include the following:

1. Complete fan performance curves for both Supply Air and Exhaust Air, with system operating conditions indicated, as tested in an AMCA certified chamber.
2. Sound performance data for both Supply Air and Exhaust Air, as tested in an AMCA certified chamber.
3. Motor ratings, electrical characteristics and motor and fan accessories.
4. Performance ratings for DX and hot water coils.
5. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
6. Estimated gross weight of each installed unit.
7. Installation, Operating and Maintenance manual (IOM) for each model.
8. Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices.
9. Energy recovery performance data for both summer and winter operation.

1.5 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.

1.6 CLOSEOUT SUBMITTALS

A. Field quality-control reports.
B. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

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. AHRI Compliance:

1. Capacity ratings for air-to-air energy recovery equipment shall comply with AHRI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."

2. Capacity ratings for air coils shall comply with AHRI 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. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

E. 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. ETL listed and wired according to the NEC with UL listed power components.

F. Unit shall comply with NFPA 90A requirements for flame spread and smoke generation, including the unit insulation.

G. Air flow data shall be in accordance with AMCA 210 testing method.

1.8 COORDINATION

A. 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 year.
2. Warranty Period for Energy Wheel Heat Exchangers: 10 years.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of each type of filter specified.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site

1. Inspect the factory packaging before opening and note any damage on the packing slip. Unpack and inspect the unit before acceptance. Dents or scratches of the casing of the unit, or substantial damage to the packing materials that may indicate internal damage to the unit, shall be cause for rejection of the unit.

B. Storage and Protection

1. After acceptance on site, until such time as the unit is being actively installed, package the unit in protective materials and stored in a protected location so as to protect the function and appearance of the unit in the as accepted condition.

PART 2 - PRODUCTS

2.1 ENERGY RECOVERY AIR HANDLERS

A. Manufacturers

1. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:

a. Valent Air Corporation, LLC
b. Des Champs Technologies.
c. Greenheck Fan Corporation.
d. RenewAire LLC.
e. SEMCO Incorporated.

B. Manufactured Units

1. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, downturn outdoor air intake with 2" aluminum mesh filter assembly, exhaust air blower, evaporator coil, energy wheel, hot water coil, hot gas reheat coil, packaged DX system, phase and brownout protection, motorized dampers, motorized recirculating damper, curb assembly, filter assembly intake air, supply air blower assembly, exhaust/relief blower assembly, filter assembly for exhaust air, and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection except with electric post heat and exhaust fan only power which have dual point power.

C. Cabinet

1. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.

2. Unit’s exterior shall be supplied from the manufacturer using G60 galvaneal steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 7023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours. Uncoated galvanized steel exterior is not acceptable.

3. Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.

4. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

    a. Materials: Rigid urethane injected foam. Foam board not acceptable.

        1) Thickness: 2 inch (50.8 mm)
        2) Thermal Resistance R13
        3) Thermally broken
        4) Meets UL94HF-1 flame requirements.
        5) Location and application: Full coverage of entire cabinet exterior to include walls, roof of unit, unit base, and doors.

5. Roof Insulation: 2 inch (50.8 mm) fiberglass located above the 1 inch (25.4 mm) foam panel.

6. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel.

D. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fans. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motors shall be capable of continuous speed modulation and controlled by a VFD.

E. Exhaust Air blower assemblies: Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.

F. Evaporator Coil: Evaporator coil shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.

G. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch.

H. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.

I. P trap: If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap, in accordance with all local and area codes and Best Practices.

J. Energy wheel: Bypass dampers are only acceptable during economizer operation – they cannot be used during normal operation. Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce laminar air flow through the wheel), an energy wheel as specified and a motor and drive assembly. The cassette shall incorporate a pre-tensioned urethane drive belt or a link style belt with a five-year warranty. The wheel media shall be a polymer film matrix in a stainless-steel framework and be comprised of individual segments that are removable for servicing. Energy wheel motor shall be variable speed. Non-segmented energy wheels are not acceptable. Silica gel desiccant shall be permanently bonded to the polymer film and is designed and constructed to permit cleaning and servicing. The energy wheel is to have a five-year warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.

K. Modulating frost control. Control system shall include an outdoor air thermostat and pressure sensor on the wheel assembly to initiate frost control sequence.

L. Indirect gas furnace

1. Shall be ETL Certified as a component of the unit.

2. Shall have an integral combustion gas blower.

3. Shall be ETL Certified for installation downstream of a cooling coil.

4. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.

5. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported by a minimum of two fabricated assemblies that support the tubes and also permit expansion and contraction of the tubes.

6. Heat exchanger shall have a 25 year extended warranty.

7. Furnace control shall be High Turndown 16:1 .

8. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal lift-off door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly and exhaust blower.

9. Shall have solid state controls permitting stand-alone operation or control by building controllers.

M. Reheat coil with factory installed modulating hot gas reheat valve.

N. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Lead condenser fan shall have EC motor to maintain condenser pressure at part load conditions. Motors shall be UL Recognized and CSA Certified. The lead refrigerant compressor(s) shall be inverter hermetic scroll-type and shall be equipped with liquid line filter drier, thermostatic expansion valves (TXV)(s), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Compressors shall be mounted within an insulated access compartment and on a raised cabinet shelf to reduce sound and vibration. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.

O. Condenser Fans: Fan blades must be constructed of aluminum or a composite material and have a geometry designed and documented to reduce sound and energy when compared to a traditional rectangular blade fan. Traditional rectangular blade fans are not allowed due to increased noise generated and increase power utilized. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan(s) will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point.] Motors shall be UL Recognized and CSA Certified. Single condenser fan running at max RPM and design static pressure shall not exceed an A-weighted sound power level of 75 db at free inlet/outlet test conditions.

P. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:

1. Global alarm condition (active when there is at least one alarm)

2. Supply Air Proving alarm

3. Dirty Filter Alarm

4. Compressor Trip alarm

5. Compressor Locked Out alarm

6. Supply Air Temperature Low Limit alarm

    a. Sensor #1 Out of Range (outside air temperature)

    b. Sensor #2 Out of Range (supply air temperature)

    c. Sensor #3 Out of Range (cold coil leaving air temperature)

    d. Phase and brownout protection: Unit shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.

Q. Motorized dampers / Intake Air, Exhaust Air, Motorized dampers of low leakage type shall be factory installed.

R. Curb Assembly: A curb assembly made of 14 gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall provide perimeter support of the entire unit and shall have duct adapter(s) for supply air and return air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly. The curb shall be the height of 18 in.

1. Hail Guards: Protects the condensing unit from damage due to extreme weather conditions such as hail and flying debris.

S. Blower

1. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.

2. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

3. Fan: Direct drive, airfoil plenum fan with aluminum wheel statically and dynamically balanced. Prop or belt-drive fan not acceptable due to low static capabilities.

4. Blades: Welded aluminum blades only.

5. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

T. Motors

1. General: Blower motors greater than 1/2 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.

2. Motors shall be 60 cycle, 3 phase 208 volts.

U. Unit Controls

1. The unit will be provided with factory mounted controls with a BACnet interface.

2. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

3. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of pushbuttons.

4. Unit supply fan shall be configured for Variable Volume.

5. Unit exhaust fan shall be configured for damper tracking.

6. Outside Air / Return Air damper control shall be field adjustable two-position.

7. Economizer control shall be temperature.

8. Dirty filter sensor shall be factory installed.

9. Operating protocol: The DDC shall be factory-programmed for BACnet MSTP.

10. Variable Frequency Drive (VFD): unit shall have factory installed variable frequency drive for modulation of the supply and exhaust air blower assemblies. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

V. Filters

1. Unit shall have permanent 2 inch (50.8 mm) aluminum filters located in the outdoor air intake and return and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the supply air stream. MERV 13 disposable pleated filters shall be provided in the supply final air stream and MERV 8 filters in the exhaust air stream.

2.2 PACKAGED ENERGY RECOVERY UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Applied Air; Mestek Technology, Inc.
2. Carnes.
3. Greenheck Fan Corporation.
4. Loren Cook Company.
5. RenewAire LLC.
6. Trane; American Standard Companies, Inc.

B. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, gasketed and calked weathertight**,** hinged access doors, removable panels with neoprene gaskets for inspection and access to internal parts, minimum 2 inch thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.

D. Heat Recovery Device: Fixed-plate heat exchanger.

E. Supply and Exhaust Fans: Forward-curved, centrifugal fan with spring isolators and insulated flexible duct connections.

1. Motor and Drive: Drive type indicated on Drawings.

2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Electrical Requirements for HVAC Equipment."

3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

5. Spring isolators on each fan having 1 inch static deflection.

F. Disposable Panel Filters:

1. Comply with NFPA 90A.

2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.

3. Factory-fabricated, viscous-coated, flat-panel type.

4. Thickness: 2 inches.

5. Minimum Arrestance: 80, according to ASHRAE 52.1.

6. Minimum Merv: MERV8, according to ASHRAE 52.2.

7. Media: Interlaced glass fibers sprayed with nonflammable adhesive.

8. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.

G. Wiring: Fabricate units with space within housing electrical conduits. Wire motors and controls so only external connections are required during installation.

1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
2. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
3. Include fused disconnect switches.
4. Variable-speed controller to vary fan capacity from 100 to approximately 50 percent.

H. Accessories:

1. Duct flanges.
2. Rubber-in-shear isolators for ceiling-mounted units.
3. Hinged access doors with quarter-turn latches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Equipment Mounting: Install air-to-air energy recovery equipment on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Specialties." Secure air-to-air energy recovery equipment to upper curb rail, and secure curb base to roof framing.

B. Install units with clearances for service and maintenance.

C. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

D. Pipe drains from units to roof; use same size as condensate drain connection.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Connect piping to units mounted on vibration isolators with flexible connectors.

D. Connect cooling condensate drain pans with air seal trap at connection to drain pan and install cleanouts at changes in pipe direction.

E. Hot Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

F. Comply with requirements for ductwork specified in Division 23 Section "Ductwork."

G. Electrical Connections: Comply with applicable requirements in Division 26 Sections.

1. Install electrical devices furnished with units but not factory mounted.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Adjust seals and purge.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Set initial temperature and humidity set points.
5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 23 72 00

SECTION 23 82 00 – TERMINAL HEATING AND COOLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of Terminal Heating and Cooling Equipment, associated accessories, and their installation:

1. Fin Tube Radiation (FTR),
2. Cabinet Unit Heaters (CUH),
3. Air Coils (RHC),

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for each unit type and configuration.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Details of anchorages and attachments to structure and to supported equipment.
3. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension components.

2. Method of attaching hangers to building structure.

3. Size and location of initial access modules for acoustical tile.

4. Size and location of access panels in hard ceilings to provide access to concealed units.

5. Items penetrating finished ceiling, including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

6. Perimeter moldings.

B. Manufacturer Seismic Qualification Certification: Submit certification that unit ventilators, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Field quality-control test reports.

B. Operation and Maintenance Data: For unit ventilators blower-coil units, fan-coil units, convectors, fin tube radiation, unit heaters, and air coils to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

C. Warranty: Executed special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.8 COORDINATION

A. Coordinate layout and installation of all units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate size and location of wall sleeves for outdoor-air intake and relief dampers.

1.9 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. Unit Ventilator Filters: Furnish 3 spare filter(s) for each filter installed.
2. Fan-Coil Filters: Furnish 3 spare filter(s) for each filter installed.

PART 2 - PRODUCTS

2.1 CABINET UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carrier Corporation.
2. McQuay International.
3. Trane.

B. Description: A factory-assembled and -tested unit complying with AHRI 440.

1. Comply with UL 2021.

C. Coil Section Insulation: ASTM C 1071; surfaces exposed to airstream shall be aluminum-foil facing to prevent erosion of glass fibers.

1. Thickness: 1 inch.
2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F mean temperature.
3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Cabinet: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect.

1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch thick, galvanized sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.

2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch thick, galvanized, sheet steel, removable panels secured with tamperproof cam fasteners and safety chain, fitted with stamped steel bottom inlet and discharge grilles where shown without connecting ductwork.

3. Recessing Flanges: Steel, finished to match cabinet.

4. Control Access Door: Key operated.

5. Base: Minimum 0.0528-inch- thick steel, finished to match cabinet, 4 inches high with leveling bolts.

6. Extended Piping Compartment: 8-inch wide piping end pocket.

7. False Back: Minimum 0.0428-inch- thick steel, finished to match cabinet.

E. Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Glass Fiber Treated with Adhesive: 80 percent arrestance and 5 MERV.
2. Pleated: 90 percent arrestance and 7 MERV.

F. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.

G. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.

2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Electrical Requirements for HVAC Equipment."

3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

H. Control devices and operational sequences are specified in Division 23 Sections "Instrumentation and Control for HVAC".

2.2 HOT-WATER FINNED TUBE RADIATION

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. Rittling, a div. of Hydro-Air Components.
2. Slant/Fin.
3. Sterling Hydronics, a Mestek company.

B. Fin Radiation: Complete enclosure of heavy-duty, institutional grade construction, continuous supporting channel and back plate, hangers and accessories as required; factory-boxed and tagged by room number and securely anchored to building in a manufacturers approved manner. Enclosures to run from wall-to-wall, unless otherwise indicated on Drawings, and provided with all necessary corner pieces, end caps, column enclosures, butt joint trims, wall sleeves, and all access doors required.

1. Heating Elements:

a. Element constructed of seamless drawn copper tubing mechanically expanded into aluminum full collar or full temper embedded fins of size shown and specified.

b. Provide tube size 3/4” as required by flow rate. Use same fin tube element tube size as pipe size shown leading to fin tube on drawings.

c. Provide elements in lengths, sizes, and capacities as shown on drawings.

1) For all fin tube shown with 4-1/2” nominal enclosure and as bare element in casework, provide element with fifty 4” x 4” aluminum fins per foot with single element nominal capacity of 1680 btu/ft-hr. at 65 deg. F entering air temperature and hot water at EWT 180 deg. F, LWT 160 deg. F.

2. Fin Tube Enclosure types:

a. Type B: Wall mounted slope top enclosure nominally 4-1/4” deep x 24” high (unless noted otherwise), with stamped slotted sloped front supply grille.

3. Enclosures:

a. Complete enclosures to run from wall-to-wall unless otherwise shown and noted on plans.

b. Materials:

1) General service: ASTM A-653/653M-94 G90 lock forming quality galvanized steel, prepared for painting via mill phosphatizing in accordance with ASTM A2092, unless otherwise noted.

c. Material gauges:

1) 16 ga.: General service.

d. Provide continuous enclosure back plate and back hanger channel of 20 ga. roll formed material same as cover, configured for positive support of cover and element. Include continuous urethane foam dirt seal between wall and channel.

e. Gusset braced cover construction with stamped outlet and inlet of configuration described above. Provide cover support brackets spaced as recommended by manufacturer but on center distances not greater than 4'. Provide brackets within 6" of end of cover and within 6" (on both sides) of each joint between sections or corner joints. All fasteners shall be concealed or tamper resistant. Fasteners shall match enclosure materials.

f. Provide matching die formed end caps, inside and outside corner pieces, wall sleeves, internal end plates, column enclosures, butt strips, valve compartments, riser chases, access doors and other accessories as shown on drawings and as required to fabricate neat, complete installation.

g. Enclosures and all trim accessories shall be phosphatized and painted inside and out with one coat of baked on alkyd enamel primer, then finished with baked enamel in color selected by Architect.

2.3 HEATING COILS FOR AIR SYSTEMS

A. General:

1. Size for face velocity and maximum pressure drops scheduled. If not scheduled, size to provide maximum of 500 fpm face velocity for cooling coils, 650 fpm face velocity for heating coils, or higher only if restricted by maximum coil size that can fit within existing units.

2. All coils to be computer optimized as to size and arrangement to meet requirements listed on drawings. Include computer selection sheets in submittal.

3. Certified in accordance with AHRI Standard 410.

4. Rate coils for the type and percentage of glycol solution called for, where applicable.

B. Hydronic Heating Coils:

1. Coils shall have all performance characteristics as scheduled or otherwise required as a minimum, including size, sensible and latent capacity, number of rows, tubing and circuits, headers, connection sizes, and water and air pressure drops.

2. Casings: Constructed of 16 gauge channels with fins tight against or recessed into the channels to minimize air bypass. Channels to have 3/8" holes on 6" centers for flanged to duct mounting. Where required by different existing duct connection conditions, provide flange mounting arrangement to match existing.

   a. Coils shall have continuously galvanized steel casing frames.

3. Headers:

   a. Provide copper, steel, or cast iron headers as required to achieve capacity, even discharge air temperatures, and water pressure drop scheduled.

      1) Seamless extra heavy wall copper tubing with brazed brass threaded supply and return connections.

      2) Gray cast iron hydrostatically tested to 400 PSIG before assembly. Headers 12 inch and larger shall be tapered to assure uniform distribution to all tubes. Provide threaded or flanged connections.

      3) Provide system connection sizes same size as connected piping as shown on drawings, unless otherwise scheduled.

      4) Provide drain and vent connections in headers.

4. Tubes, unless otherwise scheduled:

   a. Seamless, 5/8” O.D., 0.024 inch min. wall copper tube primary surface, expanded into the fin collars for a permanent fin tube bond and brazed copper header into the header for a leak tight joint at 250 PSIG air pressure under water.

   b. Return bends shall be .035" min. wall machine die formed and wrinkle free at the bend I.D.

5. Fins:

   a. Continuously configured .006" min. plate type fins with full fin collars for accurate spacing and maximum fin - tube contact.
   b. General heating coil fin material: aluminum.
   c. Cooling coil, and as otherwise noted on drawings, fin material: Heresite coated aluminum or copper.

6. The complete coil core shall be tested with 315 psi min. air (or nitrogen) pressure under warm water and guaranteed for 250 psig working pressure.

7. Bronze spring type turbulators shall be used where necessary to attain required capacity at the available GPM and entering water temperature, without increase in scheduled water pressure drop.

8. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carrier or equal
    b. Enviro-tec or equal
    c. Heatcraft Refrigeration Products LLC; Heat Transfer Division.
    d. McQuay or equal.
    e. Super Radiator Coils.
    f. Trane or equal
    g. USA Coil & Air.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive equipment for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Examine roughing-in for piping and electrical connections to verify actual locations before unit installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install equipment in compliance with NFPA 90A.
B. Install equipment level and plumb.
C. Suspend motorized equipment from structure with threaded steel rods and minimum 0.25-inch static-deflection, elastomeric vibration isolation hanger.
D. Refer to Section 23 63 00 "Refrigerant Condenser Units" for condensing units matched to refrigerant cooling coil packaged in unit ventilators.

3.3 FREEZE-PROTECTION

A. Take all precautions to prevent uncontrolled infiltration of outdoor air to coils and piping, including (but not necessarily limited to) following preventative steps:

B. Provide sleeves, safing, insulation, caulking, etc..., as required to make neat and airtight connection to outside air intakes, with no uncontrolled infiltration permitted.

C. If walls are in such condition that it is impossible to plumb the units with the walls and get correct sealing through standard methods, notify the Owner and Architect of proposed solution, and modify methods as required. Units must seal tightly against the walls and prevent infiltration.

D. Insure that adapter back wall boxes are properly installed and sealed and that no air is permitted to leak past them. Insulate per section 23 07 00 “HVAC Insulation”.

E. Adjust outdoor air dampers on the units to close tightly when in the unoccupied position (100% closed).

F. All openings in the outside air intake path between the intake louver and the outside air control damper which could permit the uncontrolled entrance of outdoor air shall be sealed and insulated. This includes but is not limited to unused holes (knockouts, etc.,), spaces around pipes and conduits, sealing wall sleeve to wall, sealing around intake louver, and other openings into piping and air compartments.

G. Insure that all freeze protection controls are in place and functional prior to freezing weather. During initial freezing weather, man job and continuously inspect for freeze concerns, provide report to Architect and Owner immediately and correct any discovered conditions which may result in freeze damage.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.

2. Unless otherwise indicated, install shutoff valve and union or flange at each connection.

3. Connect piping to equipment using specialties as detailed on drawings, with at minimum isolation valves, unions, and P/T test ports supply and return, with control valve on return as specified.

4. Pipe cooling coil condensate through properly sized accessible p-trap to approved point of indirect waste discharge. Pipe auxiliary drain pan connection to point of conspicuous discharge where minimal damage to building components will occur. Coordinate location of discharge with Owner and Architect in field.

B. Install refrigerant piping as required by Division 23 Section "Refrigerant Piping," and add refrigerant as required to compensate for length of piping.

C. Connect supply and return ducts to ducted equipment with flexible duct connectors specified in Section 23 31 00 " Ductwork". Comply with safety requirements in UL 1995 for duct connections.

D. Ground and wire equipment according to the stricter of manufacturer’s and Division 26 requirements.

3.5 FIELD QUALITY CONTROL

A. Ensure Manufacturers provide:

1. Thorough instruction of installing Contractor’s personnel in installation of units.
2. Instruction for Owner's personnel in operation and care of equipment.
3. Maintenance brochure.
4. Adjustment of air discharge pattern to suit each room as directed and approved.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. After installing equipment, inspect for damage to finish. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

D. Remove and replace malfunctioning and damaged units and retest as specified above.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 82 00

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section and to all of Divisions 26.

1.2 SUMMARY

A. Section Includes:

1. General requirements applicable to components and systems included in Electric Contract.

B. Products Installed but Not Furnished Under This Section

1. Make electrical connections to equipment shown on Drawings and furnished by other Contractors. Obtain approved wiring diagrams and location drawings for roughing in and final connections from Contractor furnishing equipment.

1.3 REFERENCES

A.	AIA	American Institute of Architects
B.	ADA	Americans with Disabilities Act
C.	AISC	American Institute of Steel Construction
D.	ANSI	American National Standards Institute
E.	ASTM	ASTM International
F.	IBC	International Building Code
G.	IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
H.	IES	Illuminating Engineering Society of North America
I.	NEC	National Electrical Code
J.	NEMA	National Electrical Manufacturers' Association
K.	NETA	International Electrical Testing Association
L.	NFPA	National Fire Protection Association
M.	UL	Underwriters' Laboratories, Inc.

1.4 SYSTEM DESCRIPTIONS

A. Inspection of Existing Systems: Inspect each existing system scheduled for modification and issue a deficiency report to Owner and Architect listing conditions found prior to any removals, relocations, or additions. Modified systems include (but are not limited to):

1. Power distribution.
2. Lighting.
3. Emergency lighting.

B. Design Requirements - Provide complete systems, properly tested, balanced, and ready for operation including necessary details, items and accessories although not expressly shown or specified, including (but not limited to):

1. Wiring and raceway for work specified in Project Manual and shown on Drawings.

2. Electrical devices and equipment for work specified in Project Manual and shown on Drawings.

3. Systems included, but not limited to:

    a. Electrical distribution.
    b. Electrical connections.
    c. Lighting.
    d. Emergency lighting.

C. Electric Layouts: Arrange panels; disconnect switches, enclosed breakers, equipment, raceways, and similar components neatly, orderly and symmetrically. Provide 3/4-inch fire treated, gray painted plywood backboards for surface mounted panels, disconnect switches, enclosed breakers, and similar equipment. Arrangements shown on Drawings are diagrammatic only; provide and adjust raceways, wiring, and other components as required.

D. Power Interruptions and Scheduled Outages: Coordinate scheduling of all power interruptions and outages with Owner. Confirm with Owner prior to interruption of power, which building systems are considered critical and must remain operational during the interruption. If a scheduled power outage is to extend beyond one standard workday, provide temporary power to operate critical building systems (including, but not limited to fire alarm system, security system, building access control system, and building energy management control system).

1.5 SUBMITTALS

A. General Division 26 submittal requirements:

1. Comply with requirements of SECTION 01 33 00 “Submittal Procedures” and as modified below.

2. Product Data: Submit product data for items listed in individual technical section. Clearly identify manufacturer, pertinent design, function, materials, construction and performance data specifically addressing specification description and Contract Document requirements of item. Strike out products that are not applicable to item being submitted, where more than one product is indicated on manufacturer product literature.

   a. Cover Sheet: Attach cover sheet, identified in Section 01 33 00, to Product Data of each item submitted. Provide cover sheet for only one type of item with related accessories, equipment with related components. Do not combine unrelated items under the same cover sheet.

   b. Specified Equivalent Product Data: Submit manufacturer’s product information including product literature, technical specifications and descriptions, performance data and, and similar items to demonstrate compatibility with Basis-of-Design Equipment as specified in the “Part 2 – Products” of each technical section.

3. Shop Drawings: Submit detailed drawings for electrical equipment layouts, showing exact sizes and locations for approval before beginning work.

   a. Do not proceed with installation of systems in each area until agreement is reached with all concerned on exact arrangements for each room or area, unless otherwise directed by Architect. If Contractor proceeds prior to resolving conflicts, Contractor shall modify installed Work as required to permit other systems to proceed with a coordinated installation.

   b. Specified Equivalent Drawings: Submit detailed drawings of proposed Specified Equivalents, indicating proposed installation of equipment and showing maintenance clearances, required service removal space other pertinent revisions to arrangement and configuration shown in Contract Documents.

4. Samples: On all submittals, indicate standard factory color and factory finish surfaces. Where more than one color is available, selection will be made by Architect from manufacturer’s full range of colors. Electronically transmitted color samples are not acceptable.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for penetration firestopping materials. Include ratings, furnished specialties and accessories.

1. Penetration firestopping materials.
2. Penetration firestopping assembly drawings.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Codes and Standards: Comply with applicable Federal, State and local building and electrical codes, laws, ordinances, and regulations, and comply with applicable NFPA, National Electrical Code and utility company requirements and regulations. Provide Underwriters Laboratories Seal on all materials.

2. Permits and Inspections: Obtain approvals, tests, and inspections required by Architect, Engineer, local electrical inspector, agent or agency specified in Project Manual, or National, State, or local codes and ordinances.

    a. Schedule electrical inspection by an agency acceptable to the local authority having jurisdiction and submit final inspection certificate to Architect.
    b. Furnish materials and labor necessary for tests and pay costs associated with tests and inspections.
    c. Conduct tests under load for load balancing and where required by codes, regulations, ordinances, or technical Specification.

3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

1.8 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:

1. Take precautions to store materials and products to protect finishes and not permit dust and dirt to penetrate equipment.
2. Replace equipment damaged beyond reasonable repair as required by Architect.
3. Refinish any equipment with marks, stains, scratches, dents, and other aesthetic damage that doesn't impede operation of equipment as required by Architect.

1.9 COORDINATION OF WORK

A. New Construction:

1. Openings, Chases, Recesses, Sleeves, Lintels and Bucks (required for admission of Electric Contract systems and components): Coordinate requirements with General Contractor for inclusion in General Contract. Furnish necessary information (e.g. locations and sizes) to General Contractor in ample time for installation of systems and components included in Electric Contract.

2. Anchor Bolts: Deliver to Contractor responsible for General Work anchor bolts required for Electric Contract construction that are to be installed in construction included in General Contract.

3. Locate settings, check locations as installation in General Contract progresses, and provide templates or holding fixtures as required to maintain proper accuracy.

B. Existing Construction:

1. Unless otherwise specified, employ Contractor responsible for General Work for all cutting, patching, repairing, and replacing of general work required for installation of systems and components included in Electric Work. Secure approval from Architect's representative before cutting.

2. Anchor Bolts: Deliver to Contractor responsible for General Work anchor bolts required for Electric Work construction that are to be installed in construction included in General Contract. Provide templates or holding fixtures as required to maintain proper accuracy.

3. Access Doors: Provide access doors shown on Drawings, or as required for access to pull boxes, junction boxes, relays and other electrical devices requiring periodic inspection, adjustment or maintenance, where located above or within inaccessible walls or ceilings, and including cutting and patching of adjacent walls and ceilings to match existing materials and finishes.

1.10 ALTERATION PROCEDURES

A. In locations where existing devices are indicated to be disconnected and removed and existing power circuit or communications cable is not scheduled to be reused:

1. Remove circuit conductors back to source.

2. Modify panel directory for that circuit.

3. Remove all existing exposed and unexposed accessible raceway.

4. Provide blank cover plates or wall infill (as indicated on plans) and as described below:

a. For single gang and multi-gang switch boxes in public or occupied spaces; stainless steel coverplates.

b. For single gang and multi-gang boxes in un-occupied spaces; stainless steel, galvanized steel or PVC coverplates.

c. For boxes larger than standard switch boxes in public or occupied spaces; remove existing box and provide wall infill, matching existing sub-surface and finished surface conditions. Paint wall to match surrounding finishes.

d. For boxes larger than standard switch boxes in un-occupied spaces; 18 gage galvanized sheet metal coverplate with machined edges. Prime and paint to match surrounding finish conditions.

5. Patch and paint existing walls where disturbed by the electrical work.

B. In locations where existing devices are to remain in place, ensure circuits feeding such devices remain operational. Modify existing circuits as required to allow new construction to occur and to maintain necessary circuitry to existing devices for complete and proper operation.

C. In locations where entire existing system is being removed or modified:

1. Refer to individual system specification sections for documentation and inspection requirements prior to any alteration work on any system.
2. Take all necessary measures to ensure that down time will not compromise safety.
3. Notify Owner, Architect and other Contractors not less than 2 weeks prior to interruptions in service.
4. Coordinate work schedule to minimize duration of system outage during hours when building is occupied.

PART 2 - PRODUCTS

2.1 PENETRATION FIRESTOPPING

A. Comply with requirements for sealants in fire rated penetrations specified in Section 07 84 13 “Penetration Firestopping”.

B. Submit Manufacturers Product Data Sheets for each type of product selected. Certify that Firestop Material is free of asbestos and lead paint and complies with local regulations.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Submit system design listings, including illustrations from qualified testing and inspection agency that is applicable to each firestop configuration.

2.2 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink, non-metallic, high strength grout, suitable for interior and exterior, above and below grade applications.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.3 SEALANTS

A. Comply with requirements for sealants in non-fire rated penetrations specified in Section 07 92 00 "Joint Sealants."

B. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Omniplus.
b. Dow Corning Corporation; 786 Mildew Resistant.
c. GE Advanced Materials - Silicones; Sanitary SCS1700.

2.4 ACCESS DOORS

A. Comply with requirements for access doors specified in Section 08 31 13 “Access Doors and Frames” for product requirements.

2.5 PAINT AND FINISHES

A. Refer to Division 09 for painting and finishing.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

A. Do not cut and vapor barriers or waterproofing for admission of any equipment or materials and do not pierce any structural members without written permission from Architect.

B. Furnish and install sleeves, inserts, panels, raceways, boxes, and similar infrastructure., ahead of general construction work and maintain Contractor personnel at Site during installation of general construction work to be responsible for and to maintain these items in position.

C. Unless otherwise noted elsewhere in Contract Documents, bear expense of cutting, patching, repairing or replacing of work of other trades made necessary by any fault, error or tardiness on part of Electrical Contract or damage done by Electric Contract. Employ and pay Contractor whose work is involved.

3.2 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS

A. Thoroughly demonstrate and instruct Owner's designated representative in care and operation of electrical systems and equipment furnished and installed in Electric Contract.

1. Factory Representative: In addition to demonstration and instruction specified above, provide technically qualified factory representatives from manufacturers of major equipment, to train Owner's representatives in care and operation of applicable products as specified in applicable technical sections of Division 26.

2. Coordinate and schedule time and place of all training through the Architect at the Owner’s convenience.

3. Submit letters attesting to satisfactory completion of instructions, including date of completion of instruction, names of persons in attendance, and signature of Owner’s authorized representative.

4. Architect's representative must be present when Owner's representatives participate in instruction.

3.3 GROUTING

A. Mix and install grout for electrical equipment base bearing surfaces, other equipment base plates, and anchors.
B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.
D. Avoid air entrapment during placement of grout.
E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout.

3.4 SEALANTS

A. Install sealants according to the requirements specified in Section 07 92 00 "Joint Sealants.”

3.5 FIRESTOPPING

A. Install firestopping according to the requirements specified in Section 07 84 13 “Penetration Firestopping.”

B. Applied Fireproofing:

1. Coordinate the installation of hangers, supports and accessories from the structural steel with the fireproofing installation. Install all hangers and supports prior to installation of fireproofing.

2. Repair or replace existing fireproofing removed as a part of Electrical Work installation.

a. Employ the services of an approved fireproofing contractor to repair or replace the fireproofing by patching any areas that have been removed or damaged due to the installation of work after the completion of the fireproofing.

C. Repaired or replacement fireproofing shall match the fireproofing adjacent to the repaired area. All warranties shall be maintained.

3.6 ACCESS DOORS

A. Install access doors according to the requirements specified in Section 08 31 13 “Access Doors and Frames.”

END OF SECTION 26 05 00

SECTION 26 05 01 – HAZARDOUS MATERIAL DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section and to all of Divisions 26.

1.2 SUMMARY

A. Section Includes:

1. Selective removal and subsequent off-site disposal of the following hazardous waste:

   a. PCB containing light ballasts.
   b. Mercury containing fluorescent light tubes.

2. Requirements for transport and disposal of hazardous waste materials by legal and appropriate means.

1.3 REFERENCES

A. Regulatory Requirements

1. United States Environmental Protection Agency (EPA)

   a. 40 CFR 260 - Hazardous waste management system: General
   b. 40 CFR 261 - Identification and Listing of Hazardous Waste.
   c. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste.
   d. 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste
   e. 40 CFR 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   f. 40 CFR 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   g. 40 CFR 266 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
   h. 40 CFR 268 - Land Disposal Restrictions
   i. 40 CFR 270 - EPA Administered Permit Programs: The Hazardous Waste Permit Program
   j. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, and Use Prohibitions.

2. United States Department of Transportation (DOT)

    a. 49 CFR 171 - General Information, Regulations, and Definitions.
    b. 49 CFR 172 - Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
    c. 49 CFR 173 - Shippers - General Requirements for Shipments and Packaging.
    d. 49 CFR 174 - Carriage by Rail.
    e. 49 CFR 175 - Carriage by Aircraft.
    f. 49 CFR 176 - Carriage by Vessel.
    g. 49 CFR 177 - Carriage by Public Highway.
    h. 49 CFR 178 - Specifications for Packaging.
    i. 49 CFR 179 - Specifications for Tank Cars.
    j. 49 CFR 180 - Continuing Qualification for Maintenance of Packaging.

3. New York State Department of Environmental Conservation (DEC)

    a. 6 NYCRR 360 - Solid Waste Management Facilities
    b. 6 NYCRR 364 - Waste Transporter Permits
    c. 6 NYCRR 370 - Hazardous Waste Management System: General.
    d. 6 NYCRR 371 - Identification and Listing of Hazardous Wastes.
    e. 6 NYCRR 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities.
    f. 6 NYCRR 373-1 - Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements.
    g. 6 NYCRR 373-2 - Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities.
    h. 6 NYCRR 373-3 - Interim Status Standards for Owners and Operators of Hazardous Waster Facilities.
    i. 6 NYCRR 376 - Land Disposal Restrictions.

1.4 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain Owner's property.

1.5 PROJECT SITE

A. Existing Conditions

1. Building Occupancy: Owner will occupy portions of building immediately adjacent to areas of hazardous material removal operations. Conduct removal operations in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of removal activities that will affect Owner's normal operations.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Labeling and Packaging Materials: Provide labeling and packaging materials as required by 49 CFR 173 Shippers - General Requirements for Shipments and Packaging.

B. Hazardous Waste Disposal Vehicles: Provide vehicles for transporting hazardous waste possessing valid Industrial Waste Hauler Permit and equipped with appropriate placards affixed as prescribed by United States Department of Transportation regulations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which hazardous material disposal is to be conducted and notify affected Contractors and Architect in writing of any conditions detrimental to proper and timely hazardous material disposal. Do not proceed with disposal until unsatisfactory conditions have been corrected.

3.2 REMOVAL, PACKAGING, TRANSPORTATION AND DISPOSAL PROCEDURES

A. Removal: Remove light ballasts and fluorescent light tubes whole and intact. Do not release PCBs or mercury to the environment.

B. Packaging: Package, label, and mark all hazardous waste materials in accordance with applicable requirements of 49 CFR 173, 178 and 179.

C. Temporary On-Site Storage and Protection: Provide storage on site of hazardous materials removed from service and scheduled for disposal to prevent damage or vandalism.

D. Temporary On-Site Storage and Protection: Provide storage on site of hazardous materials removed from service and scheduled for disposal complying with requirements of 6 NYCRR 372.2 (a) (8). Do not exceed 180 days storage on site.

E. Disposal - Transport hazardous waste to treatment or disposal facility that:

1. Is permitted, licensed or registered by state to dispose of hazardous waste;

2. Has interim status to dispose of hazardous waste;

3. Is authorized to manage hazardous waste under Resource Conservation and Recovery Act (RCRA) or

4. Is facility which:

   a. Beneficially uses or reuses, or legitimately recycles or reclaims its waste; or
   b. Treats its waste prior to beneficial use or reuse, or legitimate recycling or reclamation.

3.3 ADJUSTING/CLEANING

A. At least weekly, remove from building site debris, rubbish, and other materials resulting from hazardous material disposal operations.

   1. If additional hazardous materials are encountered during hazardous material disposal operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

   2. Burning of removed materials not permitted on Project Site.

   3. Transport materials removed and legally dispose off-site.

END OF SECTION 26 05 01

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 2000 V and less.
2. Wires and cables for PV systems rated 2000 V and less.
3. Connectors, splices, and terminations rated 2000 V and less.

B. Related Requirements:

1. Section 27 15 00 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 CLOSEOUT SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

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. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable used in VFC circuits.

E. Conductors: Copper complying with NEMA WC 70/ICEA S-95-658.

1. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2 and Type XHHW-2.

F. Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. Ideal Industries/Buchanan

B. Description: Factory-fabricated connectors and splices 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 application.

1. Conductors No. 8 AWG and smaller: Screw on, wing nut wire connectors with fixed square wire threads and wide throated skirt. UL 486C Listed.

2. Conductors No. 6 AWG to 3/0 AWG: Bolt on type or crimped type compression, seamless copper connectors using hand or hydraulic tool, color coded to wire size. Connector shall be electro-tin plated to resist electrolytic corrosion. UL 486A and UL 486B Listed.

3. Conductors No. 4/0 AWG and larger: Compression type solderless connector, long barrel seamless copper with minimum 2 pressure points per conductor. Fully compatible with industry standard crimping tool-die sets. Color coded to wire size and electro-tin plated to resist electrolytic corrosion. UL 486A Listed.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; stranded.
B. Branch Circuits: Copper, stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway**.**
D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway
E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway
G. Branch Circuits in Cable Tray: Metal-clad cable, Type MC.
H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Wire and Cable Installation: Install all wire and cable in approved raceway with exit light circuits, emergency lighting circuits, and special systems wiring installed in separate raceways. Use UL approved lubricants for wire pulling. Tag all feeders, subfeeders, special system wiring and branch circuit wiring at each pull box, junction box, and gutter space indicating point of origin and termination. Install green grounding wire in all raceways for connection to equipment, motors, transformers, and similar equipment. Install low voltage cables as detailed in individual sections.

B. Splices and Terminations: Make all splices accessible. Insulate all splices, taps, and connections to insulation value of conductor. Follow all instructions and recommendations of splice material manufacturer. Terminate low voltage cables with termination blocks as described in individual sections.

    1. Common Neutral Conductor: Do not use common neutral for multiple branch circuits.

C. Pull all conductors together where more than one is being installed in raceway.

D. Do not exceed maximum pulling tension of wire being installed. Use pulling compound or lubricant, where necessary. Use compound that will not deteriorate conductor or insulation.

E. Use pulling means, including fish tape, cable or rope that cannot damage raceway or wire.

F. Replace wiring damaged during installation.

G. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

H. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

I. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

J. 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.

K. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

L. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

M. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

N. Metal Clad Type "MC" Cable:

1. Install MC cable, parallel and perpendicular to surfaces or structural members following surface contours, where possible.

2. Do not use MC cable for home runs (from panel to first device in branch circuit).

3. Do not install exposed metal clad cable in any areas, including mechanical and electrical spaces.

4. Do not penetrate floor slabs with MC cable.

5. Metal clad cable may be used for switch, receptacle, light fixture, device and fixture branch circuit wiring above ceilings and in walls beyond corridor walls.

6. MC cable shall include a neutral, whether used or not, to a light switch location.

7. Above corridor ceilings, use MC cable for 6 foot light fixture whips.

8. Maintain a clearance of at least 6 inches from hot water and other high temperature pipes and telecommunications conduits, and at least 12 inches from unshielded telecommunications cables.

9. Support MC cable every 6 feet, and within 1 foot of every box, fitting, and cable termination. Do not support MC cable on hung ceilings or on ceiling support wires. The use of cable ties to support MC cable is prohibited.

10. Use MC cable in branch circuit wiring in movable metal partitions and movable gypsum partitions. Install conductors in accordance with partition manufacturer's recommendations.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

D. Splices:

1. Dry Locations:

a. Conductors No. 8 AWG or Smaller: Use spring type pressure connectors or indent type pressure connectors with insulating jackets (except where special type splices are required).

b. Conductors No. 6 AWG or Larger: Use un-insulated indent type pressure connectors. Fill indentations with electrical filler tape and apply insulation tape to insulation equivalent of the conductor, or insulate with heat shrinkable splices.

c. Gutter Taps in Panelboards: Install gutter tap, fill indentations with electrical filler tape and apply insulation tape to insulation equivalent of the conductor, or insulate with gutter tap cover.

2. Damp Locations: As specified for dry locations, except apply moisture sealing tape over entire insulated connection (moisture sealing tape not required if heat shrinkable splices are used).

3. Wet Locations: Use un-insulated indent type pressure connectors and insulate with resin splice kits or heat shrinkable splices. Exception: Totally enclosed splices above ground protected in NEMA 3R, 4, 4x enclosures may be spliced as specified for damp locations.

E. Terminations:

1. Conductors No. 10 AWG or Smaller - Use terminals for:

a. Connecting control and signal wiring to terminal strips.
b. Connecting wiring to equipment designed for use with terminals.

2. Conductors No. 8 AWG or Larger - Use compression or mechanical type lugs for:

a. Connecting cables to flat bus bars.
b. Connecting cables to equipment designed for use with lugs.

3. For Conductor Sizes Larger than Terminal Capacity on Equipment: Reduce larger conductor to maximum conductor size that terminal can accommodate (reduced section not longer than one foot). Use compression or mechanical type connectors suitable for reducing connection.

F. Provide insulated green ground conductor for each branch and feeder circuit.

G. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

H. All connections and terminations installed according to manufacturer's recommendations.

I. All bolted or screw-type terminations specifically torqued to setting specified by manufacturer.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."
B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 13 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:

    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.

    b. Test bolted connections for high resistance using the following:

        1) A low-resistance ohmmeter.
        2) Calibrated torque wrench.
        3) Thermographic survey after electrical system activation and is under load.

    c. Inspect compression applied connectors for correct cable match and indentation.

    d. Inspect for correct identification.

    e. Inspect cable jacket and condition.

    f. Insulation-resistance test on each conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.

    g. Continuity test on each conductor and cable.

    h. Uniform resistance of parallel conductors.

3. Initial Infrared Scanning: Before Substantial Completion, perform an infrared scan of each splice and termination in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

    b. Record of Infrared Scanning: Prepare a certified report that identifies splices and terminations checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

4. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice and termination 11 months after date of Substantial Completion.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: 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. Foundation steel grounding.

1.3 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. Comply with UL 467 for grounding and bonding materials and equipment.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Instructions for periodic testing and inspection of grounding features at test wells, ground rings and grounding connections for separately derived systems based on NETA MTS.

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

2) Include recommended testing intervals.

B. Field quality-control reports.

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 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: No. 6, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless, non-reversible compression or exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

F. Cable-to-Cable Connectors: Non-reversible compression or exothermic-type, copper or copper alloy.

G. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

H. Conduit Hubs: Mechanical type, terminal with threaded hub.

I. Ground Rod Clamps: Non-reversible compression or exothermic-type, copper or copper alloy.

J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

K. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install stranded conductors for all sizes unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum unless indicated otherwise on drawings.

1. Bury at least 24 inches (600 mm) below grade.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. 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.

8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. 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.

D. 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.

E. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 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. 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.

C. 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. Bond each above ground portion of gas piping system downstream from equipment shutoff valve.

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.5 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding terminal bar and at the grounding electrode conductor where exposed.

1. Label Text: “If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. 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.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare and submit all test and inspection reports

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity to 1000 kVA: 5 ohms.
2. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
3. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

F. Provide all test and inspection reports with closeout submittals.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with Division 3 section “Cast-in-Place Concrete”.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

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. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

4. Painted Coatings: Manufacturer’s standard painted coating applied according to MFMA-4.

5. U-Channel Strut Systems: Provide 16 gauge steel U-channel strut system for supporting electrical equipment of types and sizes indicated with 9/16-inch diameter holes at 8 inches on center on top surface, with standard galvanized or PVC finish and following fittings that mate and match with U-channel:

a. Fixture hangers.
b. Channel hangers
c. End caps
d. Beam clamps
e. Wiring stud.
f. Thin-wall raceway clamps.
g. Rigid conduit clamps.
h. Raceway hangers.
i. U-bolts.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. 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.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored 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 malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. 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. 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:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

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 in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.

7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

2.3 MANUFACTURED SUPPORTING DEVICES

A. General: Provide supporting devices, complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation, and as specified in this Section. Where more than one type of device meets indicated requirements, select device according to Contractor's option.

1. Fasteners:

a. Standard Bolts and Nuts: ASTM A 307, Grade A, regular hexagon head.
b. Lag Bolts: FS FF-B-561, square head type.
c. Machine Screws: FS FF-S-92, cadmium plated steel.
d. Machine Bolts: FS FF-B-584 heads; FF-N-836 nuts.
e. Wood Screws: FS FF-S-111 flat head carbon steel.
f. Plain Washers: FS FF-W-92, round, general assembly grade carbon steel.
g. Lock Washers: FS FF-W-84, helical spring type carbon steel.
h. Toggle Bolts: Tumble-wing type; FS FF-B-588, type, class and style as required to sustain load.
i. Stainless Steel Fasteners: Type 302 for interior Work; Type 316 for exterior Work.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. 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 single-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

E. Install hangers, supports, clamps and attachments to support raceway properly from building structure. Arrange for grouping of parallel runs of horizontal raceways to be supported together on trapeze type hangers where possible.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Fasteners

1. Materials:

a. Dry Locations: Use cadmium or zinc coated anchors and fasteners.
b. Damp and Wet Locations: Use hot dipped galvanized or stainless steel anchors and fasteners.
c. Corrosive Atmospheres Or Other Extreme Environmental Conditions: Use fasteners made of materials suitable for conditions.

2. Types (unless otherwise specified or indicated):

a. Use cast-in-place concrete inserts in fresh concrete construction for direct pull-out loads such as shelf angles or fabricated metal items and supports attached to concrete slab ceilings.

b. Use anchoring devices to fasten items to solid masonry and concrete when anchor is not subjected to pull out loads, or vibration in shear loads.

c. Use toggle bolts to fasten items to hollow masonry and stud partitions.

E. Attachment Devices

1. Make attachments to structural steel or steel bar joists wherever possible. Provide intermediate structural steel members where required by support spacing.

2. Make attachments to steel bar joists at panel points of joists.

3. Do not drill holes in main structural steel members.

4. Use "C" beam clamps for attachment to steel beams

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 Light Steel: Sheet metal screws.

7. 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

8. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

F. Raceway Support

1. Use pipe straps and specified method of attachment where raceway is installed proximate to surface of masonry construction.

2. Use hangers secured to surface with specified method of attachment where raceway is suspended from the surface.

3. Use "C" beam clamps and hangers where raceway is supported from steel beams.

4. Use channel support system supported from structural steel for multiple parallel raceway runs.

5. Where raceways are installed above ceiling, do not rest raceway directly on runner bars, T-bars, etc.

   a. Raceway Sizes 2-1/2 Inches and Smaller: Support raceway from ceiling supports or from construction above ceiling.
   b. Raceway Sizes Over 2-1/2 Inches: Support raceway from beams, joists, or trusses above ceiling.

G. Light Fixture Support

1. Do not support fixtures from ceilings or ceiling supports unless specified or indicated on Drawings.

   a. Comply with NEC, Article 410.36 – Means of Support.
   b. Support fixtures with hanger rods attached to beams, joists, or trusses–of largest standard diameter-that fits in mounting holes of fixture.
   c. Where approved, channel supports may span and rest upon lower chord of trusses and be used to support lighting fixtures.
   d. Where approved, channel supports may span and be attached to underside of beams, joists, or trusses and be used to support lighting fixtures.

2. Use 2 nuts and 2 washers on lower end of each hanger rod to hold and adjust fixture (one nut and washer above top of fixture housing, one nut and washer below top of fixture housing).

   a. Where adequately supported outlet box is specified to support fixture or be used as one point of support, support box so that box may be adjusted to bring face of outlet box even with surface of ceiling.

3. Ceiling Mounted Lighting Fixtures: Provide at least following number of supports with additional supports when recommended by fixture manufacturer or shown on Drawings.

   a. Support individual fluorescent fixtures less than 2 feet long at 2 points.

   b. Support continuous row fluorescent fixtures less than 2 feet wide at points equal to number of fixtures plus one. Uniformly distribute points of support over row of fixtures.

   c. Support individual fluorescent fixtures 2 feet or wider at 4 corners.

   d. Support continuous row fluorescent fixtures 2 feet or wider at points equal to twice number of fixtures plus 2. Uniformly distribute points of support over row of fixtures.

   e. Use adequately supported outlet box as one point of support for fixtures weighing less than 50 pounds.

   f. Support recessed mounted fixtures directly from suspension system of suspended acoustical ceilings and securely fasten fixtures to framing members of ceiling using lock clips, wirelashing or leveling supports. Support each fixture weighing more than 50 pounds (including lamps) independent of suspended ceiling grid.

4. Wall Mounted Lighting Fixtures: Provide at least following number of supports with additional supports when recommended by fixture manufacturer or shown on Drawings.

   a. Support individual fluorescent fixtures 2 feet long or less at 2 points.
   b. Support individual fluorescent fixtures over 2 feet long at 3 points.
   c. Support continuous row fluorescent fixtures at points equal to twice number of fixtures. Uniformly distribute points of support.
   d. Adequately supported outlet box may be used as one point of support for fixtures weighing less than 50 pounds

H. Channel Support System: Channel supports may be used, as approved, to accommodate mounting of equipment with following material and finish.

1. Dry Locations: 16-gage steel channel support system with standard finish.
2. Damp and Wet Locations: 16-gage steel channel support system with hot dipped galvanized or PVC finish

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 5 – Metal Fabrications for site fabricated metal supports.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions for approved equipment but not less 4 inches (100 mm) larger in both directions than the supported unit. Anchors will be a minimum of 10 bolt diameters from the edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Cast-in –Place Concrete.

C. Anchor equipment to concrete base:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. ENT: Electrical nonmetallic tubing.
C. EPDM: Ethylene-propylene-diene terpolymer rubber.
D. FMC: Flexible metal conduit.
E. GRC: Galvanized rigid steel conduit
F. LFMC: Liquidtight flexible metal conduit.
G. LFNC: Liquidtight flexible nonmetallic conduit.
H. NBR: Acrylonitrile-butadiene rubber.
I. RNC: Rigid nonmetallic conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets, custom enclosures, cabinets, handholes and boxes.

1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT, TUBING AND FITTINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. O-Z Gedney; a unit of General Signal.
7. Wheatland Tube Company.

B. Galvanized Rigid Steel Conduit (GRC): Rigid, hot dipped galvanized steel with galvanized threaded malleable iron fittings and bushings with insulated throat (galvanized steel). ANSI C80.1 and UL 6.

C. Electrical Metallic Tubing (EMT): Metallic galvanized steel tube with galvanized steel compression or setscrew type fittings and bushings with insulated throat (galvanized steel). ANSI C80.3 and UL 797.

D. Flexible Metal Conduit (FMC): Flexible, interlocked aluminum metal strip with galvanized screw-in type steel fittings. UL 1.

E. Liquid Tight Flexible Metal Conduit (LFMC) : Liquid-tight flexible metal raceway with single, flexible, continuous, interlocked and double-wrapped steel core galvanized inside and outside, coated with liquid tight jacket of flexible polyvinyl chloride (PVC). UL 360.

F. Fittings:

1. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

2. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.

3. Fittings for EMT:

a. Material: Steel.
b. Type: Setscrew or compression.

4. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

G. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. Thomas & Betts Corporation.
12. RACO; a Hubbell Company.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: NEMA TC 2, UL 651, Type EPC-40-PVC**,** with matching fittings by same manufacturer as the conduit.

D. ENT: Comply with NEMA TC 13 and UL 1653.

E. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

F. LFNC: UL 1660.

G. Fittings for LFNC: UL 514B.

H. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Arnco Corporation.
2. Endot Industries Inc.
3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible type, approved for plenum installation.

2.4 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, UL 870 and NEMA 250, Type 1, 12, 3R, as indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type or as indicated with manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.

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. Hubbell, Inc.
b. Thomas & Betts Corporation.
c. Walker Systems, Inc.; Wiremold Company (The).
d. Wiremold Company (The); Electrical Sales Division.

C. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.

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. Butler Manufacturing Company; Walker Division.
b. Enduro Systems, Inc.; Composite Products Division.
c. Hubbell Incorporated; Wiring Device-Kellems Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. 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:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

C. Outlet Boxes

1. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

2. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy**,** Type FD, with gasketed cover.

3. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

4. Materials

a. Recessed Applications and Exposed Applications in Unfinished Spaces: Galvanized, stamped steel.

b. Boxes in stud walls shall be 4” square, 2 1/8” deep boxes with raised covers for power circuits. Provide “Far-Side” box support to keep box alignment parallel with wall face.

c. Boxes in masonry walls shall be 3 ½” deep masonry boxes, single or multigang as required

d. Exposed Applications: In finished spaces requiring exposed applications, provide boxes to match surface raceway system. In situations where surface mount conduits are allowed, condulet style boxes shall be used. Where surface mount devices are provided as components of specific systems, provide surface mount box from same manufacturer to match device.

e. Concrete and Wall in Wet Locations: Heavy duty cast aluminum, thermoset protective silver grey finish, with threaded mounting posts.

f. Weatherproof Outlet Boxes: Corrosion-resistant cast metal weatherproof outlet wiring boxes of appropriate type, shape, size and depth, with threaded conduit ends and cast metal face plates with cover suitably configured for each application~~,~~ and including face plate gaskets and corrosion resistant fasteners. Do not compromise outlet weatherproof integrity when attachment plug is inserted.

g. Junction and Pull Boxes: Galvanized code gauge sheet steel boxes with screw-on covers, of appropriate type, shape and size suitable for box location and installation with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

5. Size: As required for number and size of raceways and conductors. Depth to suit wall depth and device installed.

6. Covers: Design and style for each type, outlet, junction box, etc.; NEMA rated for each location.

D. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.

E. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

F. Metal Floor Boxes:

1. Material: sheet metal.

2. Type: Fully adjustable.

3. Shape: Rectangular.

4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND CABLING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering of system contained within.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Source Quality Control for Underground Enclosures

1. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

2. Tests of materials shall be performed by an independent testing agency.

3. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

4. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Raceway Installation: Securely support raceway from building construction, separately from outlet boxes and junction boxes. Secure to masonry surfaces with expansion anchors. Use galvanized hanger rods, inserts and hangers. Conceal all raceway runs except in mechanical rooms, storage room ceilings, and areas above suspended ceilings. Run exposed raceway neatly, parallel and level, to ceilings, walls and floors. Make necessary offsets and bends to comply with construction. Install expansion fittings at all building expansion joints. Support all raceways with clamps per National Electric Code

1. GRC Installation: Use GRC in concrete slabs, below concrete slabs, below grade, damp locations, exterior locations and in hazardous locations. Where exposed leaving concrete slabs, extend minimum 6 inches above and below slabs. Use GRC elbows when penetrating concrete slab from PVC raceway below or in slabs.

2. RNC: Use for underground applications, in slabs, and below slabs. Provide rigid raceway when extending through slabs. Install in accordance with requirements of Article 352 of NEC. Make solvent-cemented joints in accordance with recommendations of manufacturer.

3. EMT: Use EMT for non-hazardous, dry locations above grade. As a minimum, use EMT in corridor ceilings, for home runs and in all unoccupied exposed interior areas. Surface mounted EMT shall not be used in finished areas without written permission from the Architect or Owner.

4. FMC: Use flexible metal conduit for final connections to motors, step-down transformers, vibrating machines, etc. Terminate with clamp type connectors and anti-short bushing. Maximum length of three feet.

5. LFMC: Use a maximum of two feet of liquid tight flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration and also where subjected to one or more of the following conditions:

    a. Exterior location.
    b. Moist or humid atmosphere where condensate can be expected to accumulate.
    c. Corrosive atmosphere.
    d. Subjected to water spray.
    e. Subjected to dripping oil, grease or water

6. LFNC: Use a maximum of three feet of liquid tight flexible nonmetallic conduit for connection to video cameras and other electrical equipment with extreme bending requirements and also where subjected to one or more of the following conditions:

    a. Exterior location.
    b. Corrosive atmosphere.

7. All non-metallic or flexible conduit shall contain a separate grounding conductor in addition to the circuit conductors.

8. Complete raceway installation before starting conductor installation.

9. Do not secure branch circuit wiring to ceiling support wires. Provide independent support wires dedicated only to electrical raceways.

10. Use roughing-in dimensions of electrically operated units furnished by supplier. Set conduit and boxes for connection to units only after receiving dimensions and after checking location with other trades.

11. Provide nylon pull cord in empty raceways. Test empty raceways with ball mandrel. Clear any raceway that rejects ball mandrel. Restore raceway and surrounding surfaces to original condition.

12. Fasten raceway terminations in sheet metal enclosures by 2 locknuts and terminate with bushing. Install locknuts inside and outside of enclosure.

13. Do not cross pipe shafts or ventilating duct openings with raceways.

14. Keep raceways at least 6 inches from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.

B. Concealed Raceways

1. Paint raceway threads in metallic raceways installed underground, in floors below grade, or outside with corrosion-inhibiting compound before assembling couplings. Draw coupling and raceway sufficiently tight to ensure water tightness.

2. For floors-on-grade, install raceways under concrete slabs.

3. Install underground raceways minimum of 18 inches below finished grade.

4. Provide raceway in furniture and any other cavity to effectively create a raceway system from the ceiling space to the outlet.

5. Stub-ups to Above Recessed Ceilings:

   a. Use EMT for raceways.
   b. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

C. Raceways in Concrete Slabs: Do not embed pipes other than electrical raceway in structural concrete and provide steel sleeves for raceway passing through concrete. Obtain Architect's approval for any variation from following requirements unless shown on Drawings. Request Architect's approval in writing accompanied by suitable sketch.

1. Place raceways between bottom reinforcing steel and top reinforcing steel.
2. Place raceways either parallel or at 90 degrees to main reinforcing steel.
3. Place nearly parallel raceways apart at least six times O.D. of raceway used.
4. Restrict O.D. of raceway in solid slabs to 1/4 of slab thickness with raceway placed in middle of that thickness.

5. Do not use raceway coating, except galvanizing or equivalent coating.
6. Do not cut or displace any reinforcement.

D. Install raceways to avoid damage or penetration of structural members. Avoid horizontal or cross runs in building partitions or sidewalls.

E. For raceway larger than 2 inches, provide minimum 2 inches between raceways vertically penetrating elevated concrete slabs. Provide fire-stopping and spray-on fireproofing at locations where raceways penetrate surface of floor slab that is part of fire rating required for construction.

F. Change from ENT to GRC before rising above floor. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Exposed Raceways

1. Use exposed raceway on exterior surfaces and interior finished spaces only when raceway type and routing are approved by Architect and Owner's representative.

2. Install exposed raceway in unfinished spaces, crawl spaces, pipe spaces, or in areas with existing exposed raceway. In areas where walls/ceilings are to be painted, exposed raceways shall be painted to match.

3. Install exposed raceways and extensions from concealed raceway systems neatly, parallel with, or at right angles to walls of building.

4. Do not run raceway through walls with plaster finish or through masonry walls or floors. Install pipe sleeves for raceway runs through these areas.

5. Install exposed raceway to avoid interfering with ceiling inserts, lights or ventilation ducts or outlets.

6. Support exposed raceways using hangers, clamps or clips. Support raceways on each side of bends and space not more than 6 ft. O.C. for 1-inch raceway and not more than 8 ft. O.C. for 1-1/4-inch raceway.

7. Provide exposed raceways for outlets on waterproof walls and set anchors supporting raceway in waterproof cement.

8. Support multiple raceway runs on trapeze style assemblies. Do not support raceway or cable from pipe, ductwork, or other raceway systems.

9. Apply exposed raceways requirements specified above to raceways installed in space above hung ceilings and in crawl spaces.

10. Do not install raceway directly on floors.

H. Minimum Raceway Size: 1/2-inch (16-mm)

I. Surface Raceways: Use surface raceways in finished spaces to conceal new cabling that cannot be installed above accessible ceiling or within walls. Use surface raceway only when raceway type and routing are approved by Architect and Owner's representative. Securely support from building construction and secure to masonry surfaces with expansion anchors. Mount at heights at locations shown on Drawings; obtain approval from Architect and Owner's representative for all routing not indicated on Drawings. Do not run surface raceway through walls with plaster finish or through masonry walls or floors. Install pipe sleeve with junction boxes or adapter fittings for raceway runs through these areas. In existing construction, run raceway along top of baseboards, taking care to avoid telephone and other signal wiring around doorframes and other openings. Run raceway on ceiling or walls perpendicular to or parallel with walls and floors.

J. Raceways for Future Use (Spare Raceways and Empty Raceways): Draw fish tape through raceways to confirm that raceway is clear of obstructions. Leave pulling-in line in each spare and empty raceway.

K. Raceway Installation in Special Areas

1. Raceways Exposed to Different Temperatures: Where portions of interior raceway system are exposed to widely different temperatures, seal interior and exterior of raceway to prevent circulation of air from warmer to colder section through raceway installation.

2. Refrigerated Rooms: Install raceway body or junction box in raceway system on warm side of refrigerated room. After cables are installed, seal raceway interior at raceway body or junction box.

3. Heated Areas to Unheated Areas: After cables are installed, seal raceway interior at nearest raceway body, outlet or junction box in heated area adjoining unheated area.

L. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Provide locknuts for securing raceway to metal enclosure with sharp edge for digging into metal and ridged outside circumference for proper fastening.

2. Provide bushings for terminating raceways smaller than 1-1/4 inches with flared bottom and ribbed sides with smooth upper edges to prevent injury to cable insulation.

3. Install insulated type bushings for terminating raceways 1-1/4 inches and larger with flared bottom and ribbed sides and with upper edge with phenolic insulating ring molded into bushing.

4. Provide screw-type grounding terminal for standard or insulated type bushing.

5. Provide miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings and plugs specifically designed for their particular application.

M. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

N. Fittings and Accessories Installation

1. Use zinc electroplate or hot dipped galvanized steel fittings and accessories in conjunction with ferrous raceways in dry and damp locations.

2. Use hot dipped galvanized fittings and accessories in conjunction with ferrous raceways in wet locations.

3. Use caps or plugs to seal ends of raceways until cable is installed (to exclude foreign material).

4. Use deflection fittings where raceways cross expansion joints that move in more than one plane.

5. Use 2 locknuts and insulated bushing (plastic bushing on 1/2-inch raceway and 3/4-inch raceway) on end of each raceway entering sheet metal cabinet or box in dry or damp locations. Terminate raceway ends within cabinet/box at same level.

6. Use watertight hub on end of each raceway entering cabinets or boxes (in wet locations) not constructed with integral threaded hubs.

7. Specific Applications:

   a. Galvanized Rigid Conduit: Use threaded fittings and accessories. Use 3-piece raceway coupling where raceway cannot be rotated.
   b. Flexible Metal Raceway: Use flexible metal raceway connectors.
   c. Liquid Tight Flexible Metal Raceway: Use “seal-tite” connectors.

8. Rigid Nonmetallic Raceway, Metal Surface Raceway, and Wireways: Use manufacturer's standard fittings and accessories.

3.2 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than 6 inches in nominal diameter or as detailed on drawings.

2. Install backfill as specified in Section 31 20 00 "Earth Moving."

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

   a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.

   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

3.3 EXISTING RACEWAYS

A. Conditions for Re-Use of Existing Raceways:

1. Existing raceway is adequately sized for new cables.
2. Remove existing cables.
3. Demonstrate to Architect that existing raceway is clear of obstructions and in good condition.
4. Install insulated bushings to replace damaged or missing bushings. Replace non-insulated bushings with insulated bushings on raceway sizes 1 inch and larger.

3.4 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on drawings or in this article are stricter.

B. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

3.5 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 “Penetration Firestopping”.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of raceway. Include type and number required for raceway material and size of raceway.

3. Pressure Plates: Carbon steel.

4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2. Sealant shall have VOC content of 40 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Sealant 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. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."

b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
C. Secure nailing flanges to concrete forms.
D. Using grout, seal the space around outside of sleeve-seal fittings.

3.4 SLEEVE INSTALLATION FOR FIRE RATED ASSEMBLY PARTITIONS

A. Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

B. Maintain indicated fire rating of walls, partitions, ceilings and floors at raceway penetrations. Install sleeves and sleeve seals with appropriate firestop materials. Comply with Division 07 Section “Penetration Firestopping”.

END OF SECTION 26 05 44

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

B. Provide identification on all equipment, raceways, boxes, conductors, and devices.

C. Identification provided should match the identification names, designations, and letters/numbers indicated on drawings, schematic and interconnection diagrams, equipment manufacturer’s shop drawings, and in specifications.

1.3 QUALITY ASSURANCE

A. Comply with ANSI 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.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

G. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

4. 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.

5. Overall Thickness: 5 mils.

6. Foil Core Thickness: 0.35 mil.

7. Weight: 28 lb/1000 sq. ft..

8. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: “DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: “WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, according to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select 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 identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

J. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify raceways and the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Exit lights
3. Power.
4. UPS.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.

b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Install underground-line warning tape for both direct-buried cables and cables in raceway.

G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels:

1. Comply with 29 CFR 1910.145.

2. Identify system voltage with black letters on an orange background.

3. Apply to exterior of door, cover, or other access.

4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

K. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own, user readable identification.

1. Labeling Instructions:

a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, Stenciled legend 4 inches high.

c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Power, Lighting, and Control:

      1) Switchboards, Panelboards, MCCs, Equipment Cabinets, Control Panels, Generators, UPS Equipment, Battery Inverter Units, Disconnect Switches, Enclosed Circuit Breakers, and Motor Controllers:

         a) Typewritten panelboard directory of circuits in the location provided by panelboard manufacturer.
         b) Provide nameplate with equipment identification as indicated on the drawings.
         c) Indicate source and location of the source.
         d) Provide nominal system voltage designation labels on cover.

      2) Disconnect Switches and Enclosed Circuit Breakers:

         a) Indicate the equipment designation and location which the disconnect serves.

      3) Motor Controllers and VFD's:

         a) Indicate the motor designation, location, and the type of service.

   b. Pull boxes, Enclosures, Junction Boxes:

      1) Provide identification labels with feeder, branch circuit, and control circuit numbers on cover.
      2) Indicate source(s) and location(s) of the source(s).
      3) Indicate the load(s) and location(s) of the load(s) served.
      4) Provide nominal system voltage designation labels on cover.

   c. Feeder Circuits, Branch Circuits, Control Circuits, Site Lighting Circuits:

      1) Provide cable tags, wire markers, and phase identification tape as appropriate.
      2) Identify circuits in each junction box, pull box, outlet box, enclosure, gutter, manhole, handhole, lighting standard base, and at each termination.
      3) Identify with circuit number, load and location served, and panel (equipment) designation and location from which it originates.
      4) Include identification of the building from which it originates for exterior circuits.

   d. Underground Conduits and Circuits:

      1) Provide warning ribbon above the underground installation. The ribbon should be capable of being identified by a metal detector. The ribbon shall include continuous lettering similar to "CAUTION BURIED ELECTRIC BELOW".

e. Empty Conduit Runs and Conduits with Conductors for Future Use:

1) Provide cable tags
2) Indicate proposed future use
3) Label conduits and conductors at both ends, including location of another end.

f. Receptacles, Switches, and Control Devices:

1) Provide identification label on faceplate.
2) Identify branch circuit number and panel designation and location from which it originates.
3) Identify receptacles supplied from GFCI-type circuit breakers as "GFCI Protected".

g. Emergency Lighting Fixtures:

1) Provide identification labels on ceiling mounted emergency light fixtures, which have integral battery ballast backup or are tied into an emergency power system (i.e. emergency generator, central battery inverter, etc.). Labels should be attached to these fixtures so that they are readily discernible, by a person standing on the normal walking surface in the area, for testing purposes.

3. Normal and Emergency Systems:

a. Equipment Cabinets, Terminal Cabinets, Control Panels, Patch Panels, Racks:

1) Provide nameplates with equipment identification as indicated on the drawings.
2) Label termination blocks and ports.
3) Provide nominal system voltage designation labels on cover

b. Pull boxes, Enclosures, Junction Boxes:

1) Provide identification labels including system type and circuit numbers on cover.
2) Indicate equipment and location(s) from which enclosed cables originate.
3) Indicate the equipment and location(s) of the equipment served.
4) Provide nominal system voltage designation labels on cover.

c. Cables and Conduits:

1) Provide cable tags, wire markers, and identification labels including system type and circuit numbers as appropriate.
2) Identify cables in each junction box, pull box, device box, enclosure, gutter, manhole, handhole, and at each termination.
3) Identify with cable number, equipment and location(s) of the equipment served, and equipment designation and location from which it originates.

4) Label conduits at both ends, including conduit number and location of other end.
5) Include identification of the building from which it originates for exterior cables.

d. Underground Conduits and Cables:

1) Provide warning ribbon above the underground installation. The ribbon shall be capable of being identified by a metal detector. The ribbon shall include continuous lettering similar to "CAUTION BURIED ELECTRIC BELOW".

e. Empty Conduit Runs and Conduits with Cables for Future Use:

1) Provide cable tags and identification labels.
2) Indicate proposed future use.
3) Label conduits and cables at both ends (including location of other end).

f. Fire Alarm:

1) Fire alarm junction boxes and pull fittings should be painted red to identify them as components of the fire alarm system as compared to other systems.

2) Remote Smoke Detector Lamps and Test Stations – Provide nameplate indicating the location of the connected device.

3) Initiation Devices, Notification Appliances, Fire Alarm Relays – Provide device identification and zone or address identification label.

4) Communication:

a) Comply with applicable EIA, TIA, and ANSI standards.
b) Data Outlets – Provide device identification label on faceplate. Identify equipment designation and location from which it originates.

5) Security:

a) Provide device identification labels.
b) Identify equipment designation and location from which it originates.

g. Access doors and panels for concealed electrical items.

END OF SECTION 26 05 53

SECTION 26 08 00 - COMMISSIONING OF ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1. See especially Section 01 08 00, “General Commissioning Requirements” for general commissioning process requirements and Commissioning Coordinator responsibilities.

1.2 SUMMARY

A. Section includes commissioning process requirements for Lighting Control Systems, which are described in more detail in the technical specification 26 09 23 “Lighting Control Devices”.

1.3 DEFINITIONS

A. CxA: Commissioning Authority.

1.4 SUBMITTALS

A. Submittals shall comply with the requirements of the Construction Contract Clauses, Section 01 33 00 "Submittal Procedures" and the individual sections specifying the work.
B. Prefunctional Checklists of readiness.
C. Prefunctional Checklists of completion of installation, prestart, and startup activities.
D. Certificates of readiness and completion of installation.
E. Test and inspection reports and certificates.
F. Corrective action documents.
G. Functional Performance Test Procedures

1.5 QUALITY ASSURANCE

A. Lighting Control Testing Technician Qualifications: Technicians to perform Lighting Control Construction Prefunctional Checklist verification tests and demonstrations, functional performance tests and demonstrations shall have the following minimum qualifications:

1. Journey-level or equivalent skill level in Electrical Testing or Installation. Vocational School four-year program graduate or an Associate’s degree in electrical systems, or similar field. Degree may be offset by three years' experience in servicing electrical systems in the HVAC or Electrical industry.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Provide Electrical work in accordance with contract document requirements for Lighting Control Systems.
B. Perform commissioning tests at the direction of the CxA.
C. Attend construction phase coordination meetings.
D. Attend testing, adjusting, and balancing review and coordination meeting.
E. Participate in Lighting Control systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
F. Provide information requested by the CxA for final commissioning documentation.
G. Provide measuring instruments and logging devices to record test data and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.7 CxA'S AUTHORITY

A. Provide Project-specific construction checklists and commissioning process test procedures for actual Lighting Control systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Directing commissioning.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.8 COMMISIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for Lighting Control system to be verified and tested.
4. Prefunctional Checklists certifying that installation, prestart checks, and startup procedures have been completed.
5. Prefunctional Checklists certifying that Lighting Control systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing and adjusting reports.

PART 2 - EXECUTION

2.1 TESTING PREPARATION

A. Certify that Lighting Control systems have been installed, calibrated, and started and are operating according to the Contract Documents.
B. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

2.2 GENERAL TESTING REQUIREMENTS

A. The CxA in cooperation with the Electrical Contractor shall prepare detailed testing plans, procedures, and checklists for Lighting control systems.

2.3 LIGHTING CONTROL SYSTEMS FUNCTIONAL TESTING PROCEDURES

A. Lighting Control System Functional Testing and Acceptance Procedures:

1. Occupancy Sensor Controls:

a. Certify that the occupant sensor has been located and aimed in accordance with manufacturer recommendations.

b. Each occupancy sensor shall be tested, where applicable.

1) Verify the correct operation of occupant sensor controls status indicators.
2) Verify the controlled lights turn off or down to the permitted level within the required time.
3) Verify the lights turn on to the permitted level when an occupant enters the space for auto-on occupant sensor controls.
4) Verify the lights turn on only when manually activated for manual-on occupancy sensors.
5) Verify the lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.

2. Daylight Responsive Controls

a. Verify control devices have been properly located, field calibrated and set for accurate setpoints and threshold light levels.
b. Verify daylight controlled lighting loads adjust to light level set points in response to available daylight.
c. Verify the locations of calibration adjustment equipment are readily accessible to authorized personal.

B. Provide documentation and certification to the CxA.

C. Lighting Control systems are shown on the contract drawings.

END OF SECTION 26 08 00

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Daylight-harvesting dimming controls, digital.
2. Indoor occupancy and vacancy sensors.
3. Low voltage controls.
4. Conductors and cables.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Daylight-harvesting dimming controls, digital.
2. Indoor occupancy and vacancy sensors.
3. Touch Screen Stations.
4. Low Voltage Controls.
5. Conductors and cables.

B. Shop Drawings:

1. Show installation details for the following:

    a. Occupancy sensors.
    b. Vacancy sensors.
    c. Daylight-harvesting dimming controls, digital.
    d. Touch Screen Stations.

2. Interconnection diagrams showing field-installed wiring.

3. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranties.

1.4 WARRANTY

A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of lighting control devices.

PART 2 - PRODUCTS

2.1 DAYLIGHT-HARVESTING DIMMING CONTROLS, DIGITAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Casambi
2. Leviton.
3. Steinel.

B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, lights are dimmed.

1. Lighting control set point is based on the following two lighting conditions:

a. When no daylight is present (target level).
b. When significant daylight is present.

2. System programming is done with two hand-held, remote-control tools.

a. Initial setup tool.
b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.

C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with integrated power pack to detect changes in indoor lighting levels that are perceived by the eye.

D. Electrical Components, Devices, and Accessories:

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Sensor Output: zero to 10 V(dc) to operate luminaires. Sensor is powered by controller unit.

3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.

E. Power Pack: Digital controller capable of accepting three 8PSJ inputs with two output(s) rated for 20 A LED load at 120 and 277 V(ac). Sensor has 24 V(dc) Class 2 power source.

1. With integral current monitoring.
2. Compatible with digital addressable lighting interface.
3. Plenum rated.

2.2 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Casambi
2. Leviton.
3. Steinel.

B. General Requirements for Sensors:

1. Ceiling mounted, solid-state indoor occupancy and vacancy sensors.

2. Dual technology.

3. Integrated power pack.

4. Hardwired connection to switch.

5. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

6. Operation:

   a. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

7. Sensor Output: Sensor is powered from the power pack

8. Power: Line voltage

9. Power Pack: Dry contacts rated for 20 A LED load at 120 and 277 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.

10. Mounting:

    a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
    b. Relay: Externally mounted through a 1/2 inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.

12. Bypass Switch: Override the "on" function in case of sensor failure.

13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.

2. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch, and detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96 inch high ceiling.

4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. when mounted 48 inch above finished floor.

2.3 LOW VOLTAGE CONTROL

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. Casambi
2. Leviton.
3. Steinel.

B. General Requirements:

1. Modern Styling.
2. LED Status Indication.
3. Interchangeable keypads.
4. 2-Wire Dialog for Data and Power.
5. BT Programmable iOS App (free).
6. Touchless Control via iOS Tap-to-Control App (free).
7. Available in multiple Colors.
8. (White, Grey, Black, Ivory, Light Almond, Red).
9. Custom Laser Etching (optional).

C. Technical Requirements:

1. 4-Button Programmable Dialog Dimmer Switch.
2. Toggle, ON, OFF, Preset Activation, Raise, Lower, Timer.
3. Target: Individual, Groups, Presets (Output, Mode Trigger, Behavior Trigger).
4. 2-Wire Dialog.
5. LED Status indication.
6. 4.12” x 1.75” x 0.75” (H x W x D) - Installs in standard gang wall boxes.
7. Dialog Dataline (24VAC).
8. Status, Standby Locator, Timer Expiration, Error.
9. Indoor, stationary, non-vibrating, non-corrosive atmosphere, and non-condensing humidity.
10. Operating temperature: 14°F to 140°F (-10°C to 60°C).
11. Storage temperature: -14°F to 140°F (-25° to 60°C).
12. ASHRAE 90.1 Compliant.
13. FCC Compliant.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF SENSORS

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3.3 INSTALLATION OF WIRING

A. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.
D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

C. Prepare test and inspection reports.

D. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 26 09 23

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lighting and appliance branch-circuit panelboards.
2. Disconnecting and overcurrent protective devices.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard including switching and overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.

2. Detail enclosure types and details for types other than NEMA 250, Type 1.

3. Detail bus configuration, current, and voltage ratings.

4. Short-circuit current rating of panelboards and overcurrent protective devices.

5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

6. Include wiring diagrams for power, signal, and control wiring.

7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.
3. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing
4. Field test reports.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
B. Handle and prepare panelboards for installation according to NECA 407.

1.8 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

   a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
   b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.
3. Comply with NFPA 70E.

1.9 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.

B. Enclosures: Flush- and surface-mounted 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. Kitchen and 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 5.

2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

3. Finishes:

a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

b. Back Boxes: Surface mount, same finish as panels and trim. Flush mount, galvanized steel.

4. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Incoming Mains Location: Top or bottom as required.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors

3. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter

4. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

5. Extra-Capacity Neutral Bus: Where indicated, neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

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. 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: Circuit breaker or lugs only, as indicated on drawings.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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. 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. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).

4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.

b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.4 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NECA 407.

C. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407. Comply with NECA 1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 90 inches above finished floor, unless otherwise indicated, and after ensuring the operating handle of the top-most switch or circuit breaker, in on position, is not higher than 79 inches (2000 mm) above the finished floor or grade.

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.

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. Stub two 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub two 1-inch empty conduits below slabs not on grade.

J. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each 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 stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: Prior to Substantial Completion Inspection perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.

b. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

F. Include test reports in Closeout Submittals.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.

2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, controlled receptacles, and associated device plates.
2. Tamper-resistant receptacles.
3. Weather-resistant receptacles.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.
B. GFCI: Ground-fault circuit interrupter.
C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
D. RFI: Radio-frequency interference.
E. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.
B. Field Quality Test Reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranded building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; TR8300.
b. Hubbell; HBL8300SGA.
c. Leviton; 8300-SGG.
d. Pass & Seymour; TR63H.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed and non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hubbell; GFTR20.
    b. Pass & Seymour; 2097-TR.
    c. Leviton; T5320.

C. Weather-Resistant, Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Leviton; GFWR2-W.
    b. Pass & Seymour; 2097-TRWR
    c. Hubbell; GFRTW20.

2.5 WIRED HALF-CONTROLLED DUPLEX STRAIGHT-BLADE RECEPTACLE

A. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

1. Receptacles with Integral Switching Means: UL CCN RTXI and UL Subject 498B.

    Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Leviton; TBR20-S1G
    b. Pass & Seymour; TR8300HCHGRY
    c. Hubbell; BR20C1GRY.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

C. Cover Plates:

1. Stainless Steel Cover Plates: Type 302 or 304, satin finish, 0.040 inch thick, accurately die cut, protected with release paper. Flush mounting plates shall be beveled with smooth rolled outer edge. Surface mounting plates shall be beveled and pressure formed for smooth edge to fit box. Single and combination plates as required to match types and sizes of specified wiring devices.

2. Weatherproof Cover Plates: Receptacles in wet locations shall be installed with a hinged outlet cover/enclosure clearly marked “Suitable For Wet Locations While in Use” and “UL Listed”. There must be a gasket between the enclosure and the mounting surface, and between the hinged cover and the mounting plate/base to assure proper seal. The installation shall be in compliance with NEC Article 406.9.

3. Dust Tight Cover Plates: Receptacles in non-hazardous, high dust environments shall be installed with a gasketed, spring door cover that closes tightly automatically to protect receptacle from dust and dirt when not in use. With plug inserted, a heavy-duty gasket in the throat of the receptacle shall seal around the plug body to keep out dust and dirt. The cover shall be suitable for mounting to standard FS/FD surface or flush mounted boxes. Suitable for all NEMA configuration receptacles and toggle switches. Appleton FSK-W series or approved equal.

D. Material for unfinished spaces: Galvanized steel.

2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: Gray or As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 5 percent or higher is unacceptable.

3. Ground Impedance: Values of up to 2 ohms are acceptable.

4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.

5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports and provide with Closeout Submittals.

END OF SECTION 26 27 26

SECTION 26 51 19 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Downlight.
2. Exit Signs
3. General Building
4. Miniature Emergency Inverters
5. Materials.
6. Luminaire support.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.
B. CRI: Color Rendering Index.
C. Fixture: See "Luminaire."
D. IP: International Protection or Ingress Protection Rating.
E. LED: Light-emitting diode.
F. Lumen: Measured output of lamp and luminaire, or both.
G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.

2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaires.

4. Include emergency lighting units, including batteries and chargers.

5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.

6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project ES LM-79and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications:

1. Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

2. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

2.2 DOWNLIGHT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Utopia.
2. Coronet
3. HE Williams.

B. Nominal Operating Voltage: 120 V -277 V ac.

C. Lamp:

1. Minimum lumens - refer to luminaire schedule.
2. Minimum allowable efficacy of 90.
3. CRI of 80 CCT of 3500k.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 0-10 percent to zero percent of maximum light output.
6. Internal driver.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. powder-coat finish.
3. Universal mounting bracket.
4. Integral junction box with conduit fittings.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position.

F. Diffusers and Globes:

1. Fixed lens.
2. Batwing light distribution.
3. UV-stabilized acrylic
4. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
5. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.
4. Recessed luminaires shall comply with NEMA LE 4.
5. Internal driver/remote drover.
6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

H. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear anodized finish.
3. With integral mounting provisions.

I. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position.

J. Diffusers and Globes:

1. Tempered Fresnel glass.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

K. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.3 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

a. Battery: Sealed, maintenance-free, nickel-cadmium type.

b. Charger: Fully automatic, solid-state type with sealed transfer relay.

c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

3. Master/Remote Sign Configurations:

a. Master Unit: Comply with requirements above for self-powered exit signs and provide additional capacity in battery for power connection to remote unit.

b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

2.4 GENERAL BUILDING

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Utopia Lighting
2. HE Williams
3. Visionaire Lighting

B. Nominal Operating Voltage: 120 V -277 V ac.

C. Lamp:

1. Minimum 2,000 lm.
2. Minimum allowable efficacy of 75lm/W.
3. CRI: Refer to luminaire Schedule.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to 10 percent of maximum light output.
6. Internal driver.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum.
2. Powder-coat finish.
3. Low-profile housing and heat sink.
4. Fully gasketed and sealed. IP 65 rated.
5. Stainless-steel latches.
6. Integral pressure equalizer.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position.

F. Diffusers and Globes:

1. Prismatic glass.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. With integral mounting provisions.

H. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for wet location.

2.5 MINIATURE EMERGENCY INVERTERS

1. Provide UL 924 listed, NFPA 101 compliant maintenance-free sealed lead acid battery miniature inverters that are designed to provide power to emergency luminaires that are suitable for damp installations with LED test switch and are inclusive of the following functions:

    a. Automatic output voltage select
    b. Automatic dimming (0-10V) relay of connected emergency luminaires under emergency lighting conditions
    c. Switched and dimmed inputs are passed through the miniature emergency inverter to the downstream emergency luminaires under normal power conditions
    d. Removable/replaceable electronics module
    e. Works with LED and fluorescent fixtures
    f. Ideal for (but not limited to) screw-base LED lamps
    g. Compatible with AC (line voltage) driven TLED lamp
    h. Remote-mounting up to 1,000 feet maximum
    i. 24 hour recharge time
    j. Minimum VA ratings of 250 VA

2.6 LUMINAIRE SCHEDULE

A. Refer to Luminaire Schedule on Drawings.

2.7 LUMINAIRE SUPPORT

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.
D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaires:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of two locations, spaced near corners of luminaire.

G. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

C. Remove and replace with new, all broken glassware, plastic or fixtures damaged before final acceptance at no additional expense to Owner.

D. No allowance made for breakage or theft before final acceptance.

E. Immediately prior to occupancy, damp clean all diffusers, glassware, fixture trims, reflectors, lamps, and replace burned- out lamps.

3.7 STARTUP SERVICE

A. Verify all luminaires function in conjunction with lighting control system and perform as intended.

1. Illumination is adequate and measured satisfactorily.
2. Dimming performs satisfactorily in accordance with specification.
3. 1 Hour of training of Owner includes technical information about luminaires and is completed in conjunction with lighting control specification.

3.8 UTILITY REBATES

A. Provide Owner with all receipts for the light fixtures, luminaires, etc. eligible for current utility rebate programs at completion of Contract, allowing Owner to apply for rebates and schedule utility company inspections. Provide copy to Architect for record.

END OF SECTION 26 51 19

SECTION 26 56 00 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luminaire-mounted photoelectric relays.
2. Luminaire types.
3. Materials.
4. Finishes.
5. Luminaire supports components.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

2. Section 26 56 13 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.
B. CRI: Color rendering index.
C. Fixture: See "Luminaire."
D. IP: International Protection or Ingress Protection Rating.
E. Lumen: Measured output of lamp and luminaire, or both.
F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.

2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaire.

4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.

5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-79and ES LM-80.

    a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.

7. Photoelectric relays.

8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above-grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Retain "Product Certificates" Paragraph below to require submittal of product certificates from manufacturers.

D. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

E. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

F. Source quality-control reports.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to be included in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 1 for every 10 of each type and rating installed. Furnish at least one of each type.
2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: 1 for every 10 of each type and rating installed. Furnish at least one of each type.
3. Diffusers and Lenses: 1 for every 10 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications:

1. Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

2. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.
B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 5 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61.

F. Bulb shape complying with ANSI C79.1.

G. CRI of **70** CCT of 4000 K.

H. L70 lamp life of 50,000.

I. Lamps dimmable from 0-10 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 120 V – 277 V ac.

L. In-line Fusing: Separate in-line fuse for each luminaire.

M. Lamp Rating: Lamp marked for outdoor use.

N. Source Limitations:

1. Obtain luminaires from single source from a single manufacturer.

2. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Visionaire Lighting
2. Zuma Lighting
3. Liton Lighting

B. Comply with UL 773 or UL 773A.

C. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.3 LUMINAIRE TYPES

A. Area:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Visionaire Lighting.
    b. Zuma Lighting
    c. Primelite

2. Luminaire Shape: Refer to drawings.

3. Mounting: Pole/light column.

4. Luminaire-Mounting Height: Refer to drawings.

5. Distribution and run time: Refer to drawings.

6. Controls: Motion, time control and constant mode capable.

7. Diffusers and Globes: Clear polycarbonate.

8. Housings:

    a. Extruded-aluminum housing and heat sink.
    b. powder-coat finish.

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Stainless steel Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.5 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Support luminaires without causing deflection of finished surface.
3. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wiring Method: Install cables in raceways. Conceal raceways and cables.

G. Install luminaires at height and aiming angle as indicated on Drawings.

H. Coordinate layout and installation of luminaires with other construction.

I. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

J. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 05 33 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

B. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

    a. IES LM-5.
    b. IES LM-50.
    c. IES LM-52.
    d. IES LM-64.
    e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

C. Luminaire will be considered defective if it does not pass tests and inspections.

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 26 56 00

SECTION 26 56 13 - LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Poles and accessories for support of luminaires.

1.3 DEFINITIONS

A. EPA: Equivalent projected area.
B. Luminaire: Complete luminaire.
C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.
D. Standard: See "Pole."

1.4 ACTION SUBMITTALS

A. Product Data: For each pole, accessory, and luminaire-supporting and -lowering device, arranged as indicated.

1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
2. Include finishes for lighting poles and luminaire-supporting devices.
3. Anchor bolts.
4. Manufactured pole foundations.

B. Shop Drawings:

1. Include mounting 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. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.

4. Anchor bolt templates keyed to specific poles and certified by manufacturer.

5. Method and procedure of pole installation. Include manufacturer's written installations.

C. Samples: For each exposed lighting pole, standard, and luminaire-supporting device and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer..

B. Material Test Reports:

1. For each pole, by a qualified testing agency.

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample Warranty: Manufacturer's standard warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For poles to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include pole inspection and repair procedures.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Pole repair materials.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1093 for foundation testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B660.
B. Store poles on decay-resistant skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
C. Retain factory-applied pole wrappings on poles until right before pole installation. Handle poles with web fabric straps.
D. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturers may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

1. Warranty Period: Five years from date of Substantial Completion.
2. Warranty Period for Corrosion Resistance: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-6-M.

B. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.

C. Live Load: Single load of 500 lbf (2200 N) distributed according to AASHTO LTS-6-M.

D. Ice Load: Load of 3 lbf/sq. ft. (145 Pa), applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

E. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.

1. Basic wind speed for calculating wind load for poles 50 feet (15 m) high or less is mph 90 mph (40 m/s).

a. Wind Importance Factor: 1.0.
b. Minimum Design Life: 25 years.
c. Velocity Conversion Factor: 1.0.

F. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.

G. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 ALUMINUM POLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Visionaire Lighting.
2. Zuma Lighting
3. HE Williams

B. Poles: Seamless, extruded structural tube complying with ASTM B221, Alloy 6061-T6, with access handhole in in pole wall.

1. Shape: Round, tapered.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Grounding and Bonding Lugs: Bolted 1/2-inch (13-mm) threaded lug, complying with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

D. Fasteners: Stainless steel size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as to substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

E. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.

F. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.

3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I clear coating of 0.018 mm or thicker), complying with AAMA 611.

G. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.

2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.

3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: As selected by Architect from manufacturer's full range.

2.3 POLE ACCESSORIES

A. Duplex Receptacle: Ground-fault circuit interrupter type, 120 V ac, 20 A in a weatherproof assembly. Comply with requirements in Section 26 27 26 "Wiring Devices."

1. Surface mounted 12 inches (300 mm) above finished grade.

a. NEMA 250, Type 3R, nonmetallic polycarbonate plastic or reinforced fiberglass, enclosure with cover; color to match pole.
b. Lockable hasp and latch complying with OSHA lockout and tag-out requirements.

B. Minimum 1800-W transformer, protected by replaceable fuses, mounted behind access cover.

C. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

2.4 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F1554, Grade 55, with a minimum yield strength of 55,000 psi (380 000 kPa).

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Refer to drawing details.
3. Threading: Uniform National CoarseClass 2A.

B. Nuts: ASTM A563, Grade A, Heavy-Hex.

C. Washers: ASTM F436, Type 1.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Manufacturer Recommendation for washer(s) provided per anchor bolt.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Examine roughing-in for foundation and conduit to verify actual locations of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE INSTALLATION

A. Alignment: Align poles as indicated.

B. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing.

C. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2 -inch (13-mm) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.4 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundation.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

1. Inspect poles for nicks, mars, dents, scratches, and other damage.
2. System function tests.

END OF SECTION 26 56 13

SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. UTP cabling.
2. Cable connecting hardware, patch panels, and cross-connects.
3. Telecommunications outlet/connectors.
4. Cabling system identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.
B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
D. EMI: Electromagnetic interference.
E. IDC: Insulation displacement connector.
F. LAN: Local area network.
G. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.
H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
I. RCDD: Registered Communications Distribution Designer.
J. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.
B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.

2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.

3. Cabling administration drawings and printouts.

4. Wiring diagrams to show typical wiring schematics, including the following:

a. Cross-connects.
b. Patch panels.
c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
B. Source quality-control reports.
C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Connecting Blocks: One of each type.
2. Device Plates: One of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.

2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Grounding: Comply with J-STD-607-A.

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ADC.
2. Belden Inc.
3. Berk-Tek; a Nexans company.
4. CommScope, Inc.
5. Draka Cableteq USA.
6. Genesis Cable Products; Honeywell International, Inc.
7. Mohawk; a division of Belden Networking, Inc.
8. Superior Essex Inc.
9. SYSTIMAX Solutions; a CommScope, Inc. brand.
10. 3M Communication Markets Division.
11. Tyco Electronics Corporation; AMP Products.

C. Description: Provide horizontal copper cable, UTP, 100 ohm in accordance with TIA-568-C.2, UL 444, ANSI/NEMA WC 66, ICEA S-90-661. Provide four each individually twisted pair, minimum size 24 AWG conductors, Category 6A, with a blue thermoplastic jacket. Cable shall be imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) and length marking at regular intervals in accordance with ICEA S-90-661. Provide plenum (CMP), riser (CMR), or general purpose (CM or CMG) communications rated cabling in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. Cables installed in conduit within and under slabs shall be UL listed and labeled for wet locations in accordance with NFPA 70.

2.4 UTP CABLE HARDWARE

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:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ADC.
2. American Technology Systems Industries, Inc.
3. Belden Inc.
4. Dynacom Inc.
5. Hubbell Premise Wiring.
6. Leviton Commercial Networks Division.
7. Molex Premise Networks; a division of Molex, Inc.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics Corporation; AMP Products.

C. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

D. Connecting Blocks: 110-style IDC for Category 6A. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable indicated.

G. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

H. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6A performance. Patch cords shall have latch guards to protect against snagging.

2. Patch cords shall have color-coded boots for circuit identification.

2.5 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Two-port-connector assemblies mounted in multigang faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 26 27 26 "Wiring Devices."

2. Metal Faceplate: Stainless steel, complying with requirements in Section 26 27 26 "Wiring Devices."

3. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

4. Legend: Factory labeled by silk-screening or engraving for stainless steel faceplates.

5. Legend: Machine printed, in the field, using adhesive-tape label.

6. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.6 GROUNDING

A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
B. Comply with J-STD-607-A.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
B. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters. Conceal pathways and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements in Section 27 05 28 "Pathways for Communications Systems."
3. Comply with requirements in Section 27 05 36 "Cable Trays for Communications Systems."

B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.

2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."

3. Install 110-style IDC termination hardware unless otherwise indicated.

4. MUTOA shall not be used as a cross-connect point.

5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for UTP at least 49 feet from communications equipment room.

6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.

7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.

10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

A. Comply with requirements in Section 07 84 13 "Penetration Firestopping."
B. Comply with TIA-569-B, Annex A, "Firestopping."
C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

1. Administration Class: 1.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

C. Comply with requirements in Section 09 91 00 "Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.

E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of comprehensive final schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

G. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.

4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

   a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.

   b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visually inspect UTP jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA/EIA-568-B.1.

2. Visually confirm Category 6A, marking of outlets, cover plates, outlet/connectors, and patch panels.

3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. UTP Performance Tests:

    a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

        1) Wire map.
        2) Length (physical vs. electrical, and length requirements).
        3) Insertion loss.
        4) Near-end crosstalk (NEXT) loss.
        5) Power sum near-end crosstalk (PSNEXT) loss.
        6) Equal-level far-end crosstalk (ELFEXT).
        7) Power sum equal-level far-end crosstalk (PSELFEXT).
        8) Return loss.
        9) Propagation delay.
        10) Delay skew.

6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

    a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.

    b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION 27 15 00

SECTION 28 31 11 - DIGITAL, ADDRESSABLE FIRE-ALARM AND VOICE NOTIFICATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Scope:

1. At the Elm Street Elementary School, provide a fire alarm voice notification module for connections to speaker strobes in renovated areas. Connect voice module to the existing fire alarm control panel. Extend existing fire alarm system as required to incorporate fire alarm work shown on the floor plans. Provide addressable devices as shown on drawings and all wiring. Provide programming for all devices.

2. Existing Fire Alarm in an addressable system. The main panel is a Faraday MPC-6000.

B. Section Includes:

1. Manual fire-alarm boxes.
2. System smoke detectors.
3. Heat detectors.
4. Notification appliances.
5. Magnetic door holders.
6. Addressable interface devices.

1.3 REFERENCES

A. Comply with New York State Uniform Fire Prevention & Building Code.

B. Comply with U.S. Department of Justice – American Disabilities Act.

C. Acoustical Society of America (ASA)

1. ASA S3.2 Method for Measuring the Intelligibility of Speech Over Communications Systems.

D. National Fire Protection Association Standards:

1. NFPA 70 - National Electrical Code.
2. NFPA 72 - National Fire Alarm Code.
3. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

E. Provide system and components listed by Underwriters Laboratories Inc. (UL) for use in fire protective signaling system under following standards as applicable:

1. UL 864 - UOJZ, APOU Control Units for Fire Protective Signaling Systems.
2. UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
3. UL 268A - Smoke Detectors for Duct Applications.
4. UL 521 - Heat Detectors for Fire Protective Signaling Systems.
5. UL 228 - Door Holders for Fire Protective Signaling Systems.
6. UL 464 - Audible Signaling Appliances.
7. UL 1971 - Visual Signaling Appliances.
8. UL 38 - Manually Activated Signaling Boxes.
9. UL 1481 - Power Supplies for Fire Protective Signaling Systems.

1.4 DEFINITIONS

A. LED: Light-emitting diode.
B. NICET: National Institute for Certification in Engineering Technologies.
C. LOC: Local Operating Console.
D. VNS: Voice Notification System.

1.5 SYSTEM DESCRIPTION

A. Non-coded, UL-certified addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

B. Provide equipment, materials, installation, inspection, and testing in strict accordance with the required and advisory provisions of NFPA 70, NFPA 72, except as modified herein. The system layout on the drawings shows the intent of coverage and are shown in suggested locations. Submit plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each conduit, and circuit layouts for all floors. Drawings shall comply with the requirements of NFPA 170. Final quantity, system layout, and coordination are the responsibility of the Contractor

C. Provide Common Intelligibility Scale (CIS) and sound pressure level calculations with the shop drawing submittal to confirm that intelligibility requirements will be met. CIS calculations shall be done with computer software intended for that purpose.

1.6 SUBMITTALS

A. General Submittal Requirements:

1. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified fire-alarm technician, Level IV minimum.

B. Product Data: Submit manufacturer′s documentation for all components of proposed fire alarm system required to demonstrate compliance with specified requirements, including (but not limited to) type, size rating, style, catalog number, manufacturer name, photographs, and catalog data sheet for each component.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.

2. Include voltage drop calculations for notification appliance circuits with the system operating on battery power, with battery voltage to the system at 20 volts.

3. Include battery-size calculations.

4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

6. Include complete one-line riser diagrams showing all equipment locations and sizes, and point-by-point wiring diagram with type and number of all conductors.

D. Qualification Data:

1. Supervisor:

a. NICET Fire Alarm Technicians to perform the installation of the system. A NICET Level 4 Fire Alarm Technician shall supervise the installation of the fire alarm system/voice notification system. A Fire Alarm Technician with a minimum of 8 years of experience shall perform/supervise the installation of the fire alarm/voice notification system. The Fire Alarm technicians supervising the installation of equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

2. Technician:

a. NICET Level III Fire Alarm Technicians with a minimum of four years of experience utilized to install and terminate fire alarm/voice notification devices, cabinets and panels. The Fire Alarm technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

3. Installer:

    a. Fire Alarm installer with a minimum of two years of experience utilized to assist in the installation of fire alarm/voice notification devices, cabinets and panels NICET Level II technician to assist in the installation of fire alarm/voice notification devices, cabinets and panels. An electrician shall be allowed to install wire, cable, conduit and backboxes for the fire alarm system/voice notification system. The Fire Alarm installer shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

4. Test Personnel:

    a. Fire Alarm Technicians with a minimum of eight years of experience (NICET Level III) utilized to test and certify the installation of the fire alarm/voice notification devices, cabinets and panels. The Fire Alarm technicians testing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

5. Manufacturer's Representative:

    a. The fire alarm and voice notification equipment manufacturer's representative shall be present for the connection of wiring to the control panel. The Manufacturer's Representative shall be an employee of the manufacturer with necessary technical training (NICET Level III or[, IV)on the system being installed.

6. Manufacturer:

    a. Components shall be of current design and shall be in regular and recurrent production at the time of installation. Provide design, materials, and devices for a protected premises fire alarm system, complete, conforming to NFPA 72, except as otherwise or additionally specified herein.

E. Regulatory Requirements

1. Requirements for Fire Protection Service:

    a. Equipment and material shall have been tested by UL and listed in UL Fire Prot Dir or approved by FM and listed in FM APP GUIDE. Where the terms "listed" or "approved" appear in this specification, they shall mean listed in UL Fire Prot Dir or FM APP GUIDE. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement. All listings or approval by testing laboratories shall be from an existing ANSI or UL published standard.

2. Fire Alarm/Voice Notification System:

    a. Furnish equipment that is compatible and is UL listed, FM approved, or listed by a nationally recognized testing laboratory for the intended use. All listings by testing laboratories shall be from an existing ANSI or UL published standard. Submit a unique identifier for each device, including the control panel and initiating and indicating devices, with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer. With reports on preliminary tests, include printer information. Include the NFPA 72 Record of Completion and NFPA 72 Inspection and Testing Form, with the appropriate test reports.

3. Fire alarm Testing Services or Laboratories:

    a. Construct fire alarm and fire detection equipment in accordance with UL Fire Protection Dir, UL Electrical Construction, or FM APP GUIDE.

4. Contractor performing fire alarm system work shall be a licensed fire alarm contractor. Contractor shall provide Fire Alarm Installation Certification with fire alarm system submittal.

F. Field quality-control reports.

G. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.

3. Record copy of site-specific software.

4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.

6. Abbreviated operating instructions for mounting at fire-alarm control panel.

7. Copy of NFPA 25.

1.7 QUALITY ASSURANCE

A. Source Limitations for Fire-Alarm/Voice Notification System and Components: Obtain fire-alarm/Voice Notification system from single source from single manufacturer.

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. NFPA Certification: Obtain certification according to NFPA 72 by a Nationally Recognized Testing Laboratory (NRTL).

1.8 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Coordinate and comply with the requirements of the local Fire Marshall, or Authority Having Jurisdiction, concerning the fire alarm system shutdown plans, procedures, and fire watch plans that will be implemented for system interruptions during construction. All existing fire alarm devices shall remain active until new cabling and devices are installed. Temporary interruptions are allowed while work is being done on the system. Work shall be coordinated so that system is fully functional at the end of the workday. If system is not fully functional at end of workday, Contractor shall provide personnel for fire watch as required by local Fire Marshall and shall be responsible for all associated costs.

2. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of fire-alarm service.

3. Do not proceed with interruption of fire-alarm service without Construction Manager and Owner’s written permission.

1.9 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building. Coordinate and comply with the requirements of the local Fire Marshall, or Authority Having Jurisdiction, concerning the fire alarm system shutdown plans, procedures, and fire watch plans that will be implemented for system interruptions during construction.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 5 percent of amount installed, but no fewer than 2 units.
2. Strobe Units: Quantity equal to 5 percent of amount installed, but no fewer than 2 units.
3. Smoke Detectors and Heat Detectors: Quantity equal to 5 percent of amount of each type installed, but no fewer than 2 units of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 2 units of each type.
5. Keys and Tools: One extra set for access to locked and tamper proofed components.
6. Audible and Visual Notification Appliances: Quantity equal to 5 percent of amount installed, but no fewer than 2 units.
7. Fuses: Five of each type installed in the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. NOTIFIER; a Honeywell company.
2. Siemens Building Technologies, Inc.; Fire Safety Division.
3. SimplexGrinnell LP; a Tyco International company.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Verified automatic alarm operation of smoke detectors
6. CO detectors.
7. Fire-extinguishing system operation.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm/voice notification appliances.
2. Identify alarm at fire-alarm control panel and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Release fire and smoke doors held open by magnetic door holders.
5. Shut down heating, ventilating, and air-conditioning equipment.
6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
7. Activate emergency shutoffs for gas and fuel supplies.
8. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.
3. Elevator shunt-trip supervision.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm/voice notification control panel.
4. Ground or a single break in fire-alarm control panel internal circuits.
5. Abnormal ac voltage at fire-alarm control panel.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm/voice notification control panel or annunciator.
9. Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system.

E. System Trouble and Supervisory Signal Actions: Annunciate at fire-alarm/voice notification control panel and remote annunciators.

2.3 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control panel.

2. Station Reset: Key- or wrench-operated switch.

3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm at locations where indicated.

2.4 SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.

2. Detectors shall be two-wire type.

3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control panel.

4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.

5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control panel for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control panel.

   a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control panel for 15 or 20 deg F (8 or 11 deg C) per minute.
   b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control panel to operate at 135 or 155 deg F (57 or 68 deg C).
   c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control panel and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control panel, having the designated access level, shall be able to manually access the following for each detector:

   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control panel and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control panel, having the designated access level, shall be able to manually access the following for each detector:

   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.

4. Each sensor shall have multiple levels of detection sensitivity.

5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.

6. Addressable Interface Device Fan Shutdown Relay: Rated to interrupt fan motor-control circuit.

2.5 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control panel.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control panel.
3. Sensor range (normal, dirty, etc.).

2.6 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Comply with UL 2075.
6. Locate, mount, and wire according to manufacturer's written instructions.
7. Provide means for addressable connection to fire-alarm system.

B. Test button simulates an alarm condition

2.7 ADDRESSABLE INTERFACE DEVICES

A. Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Microelectronic relay module: Relay shall have form C dry contacts. NRTL listed for use in providing a system address for providing a signal to:

1. Air handling units to initiate fan shutdown.
2. Elevator controller to initiate elevator recall.
3. Circuit-breaker shunt trip for power shutdown.

2.8 NOTIFICATION APPLIANCES

A. Fire Alarm/Voice Notification Speakers

1. Audible appliances shall conform to the applicable requirements of UL 464. Appliances shall be connected into notification appliance circuits. Surface mounted audible appliances shall be factory painted red.

a. Speakers shall conform to the applicable requirements of UL 1480. Speakers shall have six different sound output levels and operate with audio line input levels of 70.7 VRMs and 25 VRMs, by means of selectable tap settings. Tap settings shall include taps of 1/8, 1/4, 1/2, 1, and 2 watts. Speakers shall incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 150 Hz to 10,000 Hz, and shall have a sealed back construction. Speakers shall be capable of installation on standard 100 mm square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single wall or ceiling mounted unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the FAVN panel.

b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 1.519 mm (16 gauge) or molded high impact plastic and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted.

c. Speakers shall utilize screw terminals for termination of all field wiring.

B. Visual Notification Appliances

1. Visual notification appliances shall conform to the applicable requirements of UL 1971 and conform to the Architectural Barriers Act (ABA). The lens of the fire alarm strobe shall be located such that the entire lens is located not less than 80 inches and not more than 96 inches above the finished floor. Fire Alarm Notification Appliances shall have clear high intensity optic lens, xenon flash tubes, and be marked "Fire" in red letters. The light pattern shall be disbursed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate shall be 1 flash per second and a minimum of 15 candela, Strobe shall be surface mounted to masonry walls and semi-flush mounted to walls constructed of gypsum wall board. Where more than two appliances are located in the same room or corridor or field of view, provide synchronized operation. Devices shall use screw terminals for all field wiring.

2.9 SMOKE DETECTOR REMOTE STATUS AND ALARM INDICATORS

A. Remote power/alarm indicator and key switch. Contains green and red LED power/alarm indicators and keyed test/reset switch mounted on a stainless steel plate.

2.10 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall mounting and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 120-V ac.
4. May be controlled directly from the FACP or remotely via a local unswitched 120 volt circuit controlled by an addressable interface device.

B. Material and Finish: Match door hardware.

2.11 DEVICE GUARDS

A. Physical Damage Guards: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

B. Pull Station Protective Guard

1. The cover shall be provided for all manual pull stations.

2. Guard shall consist of a clear, tamperproof, tough polycarbonate shield, frame, and piezo horn,

3. When the protective guard with horn is lifted to gain access to the protected alarm, a piercing self-contained 95 or 105 dB warning horn (at one foot) shall sound.

4. The cover shall be connected to the frame by a cable. When the cover is lifted, the cover drops off of the frame and the horn shall sound until the cover is snapped back onto the frame.

2.12 ADDITIONAL FIRE ALARM DEVICES

A. Additional fire alarm devices not indicated on drawings, the devices below can be added at any time during construction up to and including project final inspections, base bid price to include device, wiring and programming.

1. Include in bid price, material and labor to wire (3) 3 phase air handling units addressable relays interfaced to existing motor starters for fire alarm fan shut down. Assume wiring lengths of 50’ from motor to nearest Signal Line Circuit. Wiring is to be on a per device basis.

2. Include in bid price, material and labor to install (6) new duct smoke detectors in existing air handling equipment and wire said detectors, assuming wiring lengths of 50’ from device to nearest Signal Line Circuit. Wiring is to be on a per device basis.

3. Include in bid price material and labor to install (4) new smoke detectors in existing storage spaces and wire said detectors, assuming wiring lengths of 50’ from device to nearest Signal Line Circuit. Wiring is to be on a per device basis.

4. Include in bid price material and labor to install (6) new smoke detectors in existing spaces and wire said detectors, assuming wiring lengths of 50’ from detector to nearest Signal Line Circuit.

5. Include in bid price material and labor to install (4) new fire alarm pull stations in existing spaces and wire said pull stations, assuming wiring lengths of 50’ from device to nearest Signal Line Circuit. Wiring is to be on a per device basis.

6. Include in bid price material and labor to install (4) new fire alarm strobe lights in existing spaces and wire said strobe lights, assuming wiring lengths of 50’ from strobe to nearest Notification Appliance Circuit. Wiring is to be on a per device basis.

7. Include in bid price material and labor to install (4) new fire alarm speaker\strobes in existing spaces and wire said horn\strobe, assuming wiring lengths of 50’ from device to nearest Signal Line Circuit, Wiring is to be on a per device basis.

2.13 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Comtran Corporation.
2. Draka Cableteq USA.
3. Genesis Cable Products; Honeywell International, Inc.
4. Rockbestos-Suprenant Cable Corp.
5. West Penn Wire; a 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, or twisted, unshielded pair, not less than No. 16 AWG. Refer to fire alarm system manufacturer for recommended sizes and shielding requirements.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS (BY INSTALLER)

A. Verification of Conditions (by Installer): Examine conditions under which fire alarm system is to be installed in coordination with Installer of materials and components specified in this Section and notify affected Contractors and Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

3.2 PROTECTION

A. Protection: Provide dust covers on all detectors during construction.

3.3 EQUIPMENT INSTALLATION

A. Install fire alarm system in accordance with applicable provisions of NEC, NFPA-70, Article 760 - Fire Protective Signaling Systems.

1. Contractor performing fire alarm system work shall be a licensed fire alarm contractor. Contractor shall provide Fire Alarm Installation Certification with fire alarm system submittal.

2. Provide all labor, materials, equipment and services to perform all operations required for complete installation of fire alarm system and related construction as shown on Drawings and specified in this Section.

3. Completely check, program and adjust all new and existing equipment on each system.

4. Label each addressable device with label indicating device's unique address. Label shall comply with Specification Section 26 05 53 Identification for Electrical Systems. Labels shall be installed so that they are visible without removing device from mounting base.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections by testing 100% of system and submitting complete test reports.

1. Connect new equipment to existing control panel in existing part of the building.

2. Connect new equipment to existing monitoring equipment at the supervising station.

3. Expand, modify, and supplement existing equipment as necessary to extend existing functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

C. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.

2. Mount manual fire-alarm box on a background of a contrasting color.

3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.

D. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. For smoke detectors, smooth ceiling spacing shall not exceed 30 feet (9 m).
4. For heat detectors, smooth ceiling spacing shall not exceed 30 feet (9 m).

5. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
6. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffusers or return-air openings.
7. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

E. Install 200 deg. F. fixed temperature heat detectors in Kitchens and Boiler Rooms. Install 135 deg. F. fixed temperature heat detectors in areas where sudden temperature changes can be anticipated (near overhead doors, heating units, etc.).

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install supply duct detectors downstream of the air filters and ahead of any branch connections. Install return duct detectors between the air handling unit and any recirculation or fresh air inlet connection. Install sampling tubes so they extend the full width of duct.

G. Fan shutdown relays shall be wired to stop unit with motor controller's control switch in any position. Locate shut down relay within 3 feet of motor controller.

H. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

I. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

J. In areas where detection and notification devices may be subject to physical damage, devices shall have protective wire guards as manufactured by Safety Technology International (www.sti-usa.com). All guards shall be listed for the fire alarm system devices and appliances protected.

K. Install all devices on exterior of building in weatherproof enclosures supplied by device manufacturer.

L. In new construction, install all devices flush or semi-flush mounted, unless otherwise authorized by Owner.

M. In existing construction, install all interior surface mounted devices on surface mounted back boxes supplied by device manufacturer.

N. In locations where new devices are replacing existing, contractor shall coordinate removal/replacement to allow re-use of existing backbox/conduits if possible.

O. In locations where building construction prohibits flush-mounted installations, provide surface raceway. At such locations obtain written authorization from Owner's representative or Architect prior to providing surface raceway device.

P. Demolition of existing system:

1. Repair all damaged surfaces upon removal of existing devices and raceway. Repair and patch existing construction to match existing finishes.

Q. Remote Status and Alarm Indicators: Install near each duct detector, smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

R. Wire the Notification Appliance Circuits such that the audible alarm indicating devices can be turned off while the visual alarm notifications remain operational.

S. Locate audible/visible signaling devices in strict accordance with requirements of Americans with Disabilities Act (ADA).

T. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install speakers on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

U. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and place strobe light lens 80 inches minimum and 96 inches maximum above floor level. In locations where ceiling height is less than 90 inches AFF, place strobe light lens 6 inches below ceiling.

V. Where combination audible/visible units used, place strobe light lens 80 inches minimum and 96 inches maximum above floor level. In locations where ceiling height is less than 90 inches AFF, place strobe light lens 6 inches below ceiling.

W. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.4 WIRING

A. Install Type FPLP plenum rated fire alarm cable for all initiating circuit wiring and notification circuit wiring, sized in accordance with manufacturer's recommendations.

B. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or raceway as signaling line circuits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. 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.

F. Install all plenum cable above corridor ceilings bundled and tie-wrapped at 5 foot intervals and hung in saddle rings or J-hooks, supported to structure at 5 foot intervals.

G. Cable shall not be considered properly supported by lying over top of conduits, piping, or building supports or bracing. Approved saddle rings or J-hooks must be used.

H. For wall mounted devices in existing construction where wiring cannot be concealed, all wiring shall be installed in surface metallic raceway from device location to an accessible ceiling space.

I. Install all wiring in approved surface metallic raceway or EMT conduit in the following locations:

1. Unfinished areas (EMT conduit).
2. Exposed areas (Surface metallic raceway).
3. Where subject to damage.

3.5 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 Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated air-conditioning duct systems.
2. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
B. Install framed instructions in a location visible from fire-alarm control panel.

3.7 GROUNDING

A. Ground fire-alarm control panel and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control panel.

3.8 ADJUSTING / CLEANING

A. Completely clean all smoke detectors, as instructed by authorized factory representative, when system is substantially complete and when authorized by Owner.

3.9 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Owner's Representative and authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

    b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. Perform 100 percent inspection and testing of all system devices.

    a. Provide complete panel real-time printout as documentation of device, date and time. Any acceptance test not accompanied by real-time printout requires retesting of entire system by Contractor, including both alarm activation tests and tests of supervisory circuit at each device.

    b. Provide inspection complying with requirements of applicable NFPA standards.

    c. Provide to Owner and Fire Code Official complete typed list of every initiation, signaling, control, supervisory and auxiliary device with specific information regarding system address of device, location of device, date tested, manufacturer's model number, and serial number of all analog components, status of device and zone or point as related to system. Obtain from Owner, the Owner's room names/numbers that are to be assigned to each device.

3. Provide complete set of battery test results for panels including:

    a. Charger output voltage under normal conditions.
    b. Charger output current under normal conditions.
    c. Open battery voltage.
    d. Supply voltage and current under primary power failure.
    e. Supply voltage and current under primary power failure and system alarm that has activated all of panel's audible, visual and control circuits.
    f. Calculations using battery test data obtained to determine minimum battery capacity of 24 hours under normal conditions and 5-minute alarm condition.

4. Take voltage readings at end of line of each alarm signal circuit to insure minimum operational levels.

    a. If voltage drop exceeds the minimum rating of the last device in the circuit, while under full circuit load, rewire circuits with appropriately heavier gage wire as required to comply with specified requirements.

5. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

6. Test visible appliances for the public operating mode according to manufacturer's written instructions.

7. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

D. Intelligibility Tests

1. Intelligibility testing of the System shall be accomplished in accordance with NFPA 72 for Voice Evacuation Systems, IEC 60268-16, and ASA S3.2. Following are the specific requirements for intelligibility tests:

    a. Intelligibility Requirements: Verify intelligibility by measurement after installation.

2. Ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required value for CIS is .7

3. The contractor must submit a waiver letter for areas of the building they believe will not meet the minimum CIS value at the beginning of the shop drawing phase. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have a CIS score less than the minimum required value if building occupants in these areas can determine that a voice signal is being broadcast and they must walk no more than 33 feet to find a location with at least the minimum required CIS value within the same area.

4. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than the minimum required value if personnel can determine that a voice signal is being broadcast and they must walk no more than 50 feet to a location with at least the minimum required CIS value within the same area.

5. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).

6. The distance the occupant must walk to the location meeting the minimum required CIS value shall be measured on the floor or other walking surface as follows:

    a. Along the centerline of the natural path of travel, starting from any point subject to occupancy with less than the minimum required CIS value.
    b. Curving around any corners or obstructions, with a 12 inch clearance there from.
    c. Terminating directly below the location where the minimum required CIS value has been obtained.

7. Use commercially available test instrumentation to measure intelligibility as specified by ISO 7240-19 and ISO 7240-16 as applicable. Use the mean value of at least three readings to compute the intelligibility score at each test location.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. 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.

3.10 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. Training shall consist of a total of 8 hours delivered in 2 hour blocks.

B. Provide copy of sign-in sheet of District staff receiving training in O&M Manuals.

END OF SECTION 28 31 11

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Stripping and stockpiling topsoil.
4. Removing above and below-grade site improvements.
5. Disconnecting, capping or sealing, and removing site utilities.
6. Temporary erosion and sedimentation-control measures.
7. Disposal of waste material.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil (insitu): Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally 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 subsoil and weeds, roots, toxic materials, or other nonsoil materials.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS, GENERAL

A. General: Submit all informational submittals required by this Section concurrently.

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.7 CLOSEOUT SUBMITTALS

A. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.8 PROJECT CONDITIONS

A. Verification of Conditions: Examine conditions under which site clearing is to be accomplished Construction Manager and and notify Architect in writing of any conditions detrimental to proper and timely accomplishment. Do not proceed with site clearing until unsatisfactory conditions have been corrected.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises in location to be determined by Owner.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

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 of construction materials, debris, or excavated material.
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 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction. Refer to Section 31 25 00, “Erosion and Sedimentation Controls”.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree or plant protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements in Section 31 25 00 "Erosion and Sedimentation Controls."

B. Should any trees or shrubs be damaged which are to be saved, arrange to have such damage treated by a licensed arborist or tree surgeon.

C. Protect tree and shrub root systems from smothering. Do not store construction materials, debris, or excavated material within plant protection zone. Do not permit vehicular traffic or parking within plant protection zone. Restrict foot traffic to prevent excessive compaction of soil over tree, shrub and turf root systems.

D. Trees or shrubs which die because of the Contractor's failure to conform to the Drawings and specifications shall be evaluated by a qualified organization selected by the Owner's Representative. The removal and replacement of the tree, and the evaluation expenses shall be paid for by the Contractor. Contractor shall be required to replace the damaged tree with plant material of comparable size and quality (i.e. damaged 12" caliper Red Maple shall be replaced by three 4" cal. or four 3" cal. Red Maples). Substitutions for variety shall be approved by the Architect.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Construction Manager and Architect not less than three working days (3 days) in advance of proposed utility interruptions.

C. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a minimum depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer in accordance with Section 31 20 00 "Earth Moving".

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Do not remove surplus topsoil from site.

D. Refer to Section 32 92 00 "Turfs and Grasses" for topsoil screening requirements.

E. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

F. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction including foundations, slabs, paving, curbs, retaining walls, aggregate base and other improvements.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically. Leave cut edge neat and square where existing material is cut to adjoin new work.

2. Remove asphalt concrete paving material to full depth and remove from site. Do not use asphalt materials for on-site fill.

3. Gravel and stone fill under removed sidewalks may be reused if suitable for the particular new use and if approved by the Architect.

4. Break up and completely remove miscellaneous concrete, such as small foundations. Remove concrete, retaining walls or foundations below grade to a minimum depth of 2'.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00

SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for foundations, walks, pavements, turf and grasses.
2. Structural Fill: For backfill under structures, pavements, concrete pads, etc.
3. Granular Fill: Sub base for interior concrete slabs-on-grade, asphalt paving, concrete paving, etc.
4. Subsurface drainage fill for foundation drains, underdrains, etc.
5. Excavating and backfilling for buildings and structures.
6. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 01 32 00 - Construction Progress Documentation
2. Section 03 30 00 - Cast-in-Place Concrete
3. Section 31 10 00 - Site Clearing
4. Section 32 92 00 - Turf and Grasses
5. Section 33 41 00 – Storm Utility Drainage Piping

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Subbase: Granular aggregate layer supporting the slab-on-grade and pavement that also minimizes upward capillary flow of pore water.

G. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Geotechnical Engineer. Authorized additional excavation and replacement material will be paid for according to changes in the Work.

2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Geotechnical Engineer or Architect. Unauthorized excavation, as well as remedial work directed by Geotechnical Engineer or Architect shall be without additional compensation.

H. Fill: Soil materials used to raise existing grades.

I. Hazardous Soil Materials: Soils that are contaminated with petroleum product and/or hazardous chemicals, waste or industrial waste.

J. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Rock Excavation: Track-mounted excavator rated at not less than 222-hp flywheel power with weight of 70,000 lbs or greater and a 30-in wide short-tip radius rock bucket. (Ratings are based on Caterpillar's "Model No. 330B".)

K. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below aggregate base, structural fill, drainage fill, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

N. Non-Granular Fill: Soil fill material used to raise existing grades in areas that do not require granular or structural fill.

O. Well-Graded: Soils containing a good range of all representative particle sizes between the largest and the smallest. All sizes must be represented, and no one size should be either overabundant or missing.

P. Poorly-Graded: Soils which either contain a narrow range of particle sizes or have some intermediate sizes lacking.

1.4 SUBMITTALS

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data: For each type of the following manufactured products required:

   a. Geotextiles.
   b. Warning tapes.

2. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

   a. Classification according to ASTM D 2487.
   b. Laboratory compaction curve according to ASTM D 1557, ASTM D 698.
   c. Submitted material testing and analysis shall demonstrate that no unsuitable soil groups are present.
   d. Submitted material testing and analysis shall demonstrate that no absorbent clays are present.

3. Samples for Verification: For the following products, in sizes or quantities indicated below:

   a. Fill: One-half gallon by volume of material in sturdy container of each type of fill, naming source for each material.
   b. Geotextile: 12 by 12 inches.
   c. Warning Tape: 12 inches long; of each color.

4. Verification of Conditions: Written confirmation from installer that installation of Earthwork Materials installed in accordance with specifications.

C. Informational Submittals:

1. Qualification Data: For qualified testing agency.

2. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Qualified Installers as defined below:

1. Earthwork Contractor Experience Requirements: Provide a list of at least four Earthwork projects of comparable size, scope, and quality completed successfully by the proposed Sub Contractor within the past two years that includes the date completed, project Owner's name and current contact information, including telephone numbers and e-mail addresses.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: If work includes improvements on adjoining property, written authorization for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary and permanent erosion- and sedimentation-control measures, specified in Division 31 Section "Erosion and Sedimentation Control" are in place.

E. Do not commence earth moving operations until plant-protection measures specified in Division 31 Sections "Erosion and Sedimentation Control" and "Site Clearing" are in place.

F. The following practices are prohibited within tree- or plant-protection zones:

1. Storage of construction materials, debris, or excavated material.
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.
8. Directing vehicle or equipment exhaust towards protection zones.
9. Heat sources, flames, ignition sources, and smoking within or near protection zones.

G. Existing Hazardous Materials:

1. If during the performance of the work suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. If present, hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Materials:

1. General: Provide imported soil materials when sufficient satisfactory soil materials are not available from onsite excavations.
2. Topsoil: Refer to Turf and Grasses Specification, Division 32.

B. Hazardous Materials:

1. Provide fill materials that are not contaminated with petroleum product, hazardous waste or industrial waste.
2. Contamination above federal, state or local requirements is not acceptable. Materials with a visible sheen or petroleum odor shall be rejected.

C. Unsuitable Soils: (Includes excavated native and imported non-granular, granular and structural fill materials)

1. Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

   a. Soils Materials shall not contain any absorbent aluminum phyllosilicates, including but not limited to: bentonite (sodium, calcium, or potassium), tonstein, montmorillonite, kaolinite. or other absorbent clays.

2. Unsuitable soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

3. Submitted material testing and analysis shall demonstrate that material classification meets ASTM-D2487 USC system criteria and that no unsuitable soil groups, or absorbent clays are present.

D. Non-Granular Fill: Material is to comply with NYSDOT requirements for Select Borrow and Select Fill with modifications shown below. This material is not allowed in areas where granular soils are required, including within the building footprint, below pavement areas or below a synthetic turf athletic field.

1. On-Site Non-Granular Fill

   a. Submittal must be provided demonstrating that on-site soil material meets the criteria outlined in this Section for use as fill material.

b. Obtain approval of Architect before proceeding with use of on-site material.

c. Material is to have no particles greater than 3" in maximum dimension, no more than 70% by weight passing the #40 sieve and no more than 20% passing the #200 sieve.

d. Testing submitted is to demonstrate that proper compaction can be achieved as required in Part 3, Execution.

2. Imported Non-Granular Fill

a. Where quantity of approved non-granular fill materials required exceeds that available from on-site stock-piles, provide suitable material from off-site sources.

b. Obtain approval of Architect before proceeding with use of imported fill material.

c. Material is to have no particles greater than 3" in maximum dimension, no more than 70% passing by weight the #40 sieve and no more than 15% passing the #200 sieve.

d. Testing submitted is to demonstrate that proper compaction can be achieved as required in Part 3, Execution.

E. Structural Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand.

Sieve Designation	**Percent by Weight Passing Square Mesh Sieves**
3 inch	100
2 inch	90 to 100
1/4-inch	30 to 65
#40	5 to 40
#200	0 to 10

F. Crushed Stone: Crushed stone to complying with New York State Department of Transportation (NYSDOT) Standard Specifications, Section 703-0201 which is product of mechanical crushing. Where indicated, provide the following fill materials, consisting of clean, free of slag, durable, sharp-angled fragments of rock of uniform quality. The crushed stone used as coarse aggregate for all items shall be obtained from sources conforming to the requirements of the NYSDOT as to sampling, testing methods, Quarry Reports and any other required procedures and complying with following requirements:

1. NYSDOT No. 1 Crushed Stone Gradation Requirements (NYSDOT 703-4 # 1 Stone):

Sieve Designation	**Percent by Weight Passing Square Mesh Sieves**
1 inch	100
1/2-inch	90 to 100
1/4-inch	0 to 15
#200	0 to 1

2. NYSDOT No. 2 Crushed Stone Gradation Requirements (NYSDOT 703-4 #2 Stone):

Sieve Designation	**Percent by Weight Passing Square Mesh Sieves**
1-1/2 inch	100
1 inch	90 to 100
1/2-inch	0 to 15
#200	0 to 1

G. Drainage Fill: Mixture of 50 percent NYSDOT No. 1 crushed stone and 50 percent NYSDOT No. 2 crushed stone, complying with New York State Department of Transportation Standard Specifications, Section 703-02.

Sieve Designation	**Percent by Weight Passing Square Mesh Sieves**
1-1/2 inch	100
1 inch	95 to 100
1/2-inch	25 to 60
# 4	0 to 10
# 8	0 to 5

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which earthwork is to be accomplished in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Architect in writing of any conditions detrimental to proper and timely accomplishment. Do not proceed with earthwork until unsatisfactory conditions have been corrected in manner acceptable to Installer.

1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

1. Contractor is entirely responsible for strength and adequacy of bracing and shoring, and for safety and support of construction from damage or injury caused by lack of adequate protection or by movement or settlement.

2. Contractors are advised that they are required to comply with Occupational Safety and Health Administration's (OSHA) standards pertaining to excavation.

3. All excavations must be barricaded at all times using either traffic or A-Frame type barricades. Gaps between barricades may be up to 6-inches wide and must be blocked with caution tape.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.3 UNDERGROUND UTILITY SURVEY

A. An underground utility survey must be conducted prior to the start of any excavation. Call 811

3.4 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.5 EXPLOSIVES

A. Explosives: Do not use explosives.

3.6 SITE CLEARING

A. Refer to Division 31 Section "Site Clearing".

3.7 EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Geotechnical Engineer. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. 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.

    a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock (refer to Definitions section: "Rock" paragraph above). Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.8 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Protect trees and other plants in accordance with requirements in Division 1 Section "Temporary Facilities and Controls" and Division 31 Section "Erosion and Sedimentation Control".

3.9 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.10 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 below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 6 inches (150 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe. Remove projecting stones and sharp objects along trench subgrade.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3. Cut and protect roots in accordance with standard nursery practice and Division 31 Section “Erosion and Sedimentation Control”.

3.11 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.
B. If Geotechnical Engineer determines that unsuitable soil is present, continue excavation and replace with compacted backfill or fill material as directed.

3.12 PROOF-ROLLING

A. Proof-roll subgrade below building slabs, concrete pads and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction and repeating proof-rolling in direction perpendicular to first direction with a minimum of six overlapping passes. Limit vehicle speed to 3 mph.

2. Excavate soft spots, unsuitable soils, and areas of excessive pumping or rutting, as identified by Geotechnical Engineer and as directed by Owner, and replace with compacted backfill or fill as directed. Notify Architect in writing of any required remediation.

3. Foundations: Proof-roll prior to excavation for foundations but after top soil is stripped.

B. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities without additional compensation.

3.13 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. CLSM (flowable fill), per this specification section, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit in accordance with this Section unless otherwise directed by Geotechnical Engineer.

3.14 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.15 SOIL STABILIZATION FABRIC

A. Install soil stabilization fabric: After subgrade has been compacted and proof-rolled, install soil stabilization fabric as specified by the manufacturer, including the following:

1. Lay fabric in the direction of traffic.
2. Overlap fabric side to side and end to end a minimum of two feet.
3. Insure that fabric lies flat during fill placement.

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, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting 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.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.17 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

D. Place and compact final backfill of satisfactory soil to final subgrade elevation.

E. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.18 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows. Refer to Part 2 for material requirements and specific conditions for the use of each type of soil material. All fill materials to be approved by Architect per requirements noted in Part 2.

1. Under grass and planted areas:

a. Use satisfactory non-granular fill material.

2. Under walks, pavements and exterior slabs:

a. Use Structural Fill below subbase layer and Type 2 granular fill for subbase layer.

3. Under steps and ramps

a. Use structural fill below subbase layer and Type 2 granular fill for subbase layer.

4. Under building slabs:

a. Use structural fill below subbase layer. For subbase, use No. 2 Crushed Stone. See Drawings for depth.

5. Under footings and foundations:

a. Use structural fill.

6. Under catch basins, manholes, vaults or other underground structures.

    a. Use structural fill or as noted on drawings.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.19 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil 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 density.

3.20 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Maximum layer depth before compaction:

1. Under Pavement: Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

2. Place backfill and fill soil materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 8 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry weight density according to ASTM D 1557:

1. Under structures, steps, and pavements :

    a. Scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

2. Under walkways:

    a. Scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.

3. Under natural turf or unpaved areas:

    a. Compact each layer of subgrade backfill or fill soil material at 85 percent. Compact all layers beneath the upper 2'-0" to at least 95 percent.

4. Utility trenches:

    a. Compact each layer of initial and final backfill soil material at 85 percent.

5. Landscape Planting Areas:

    a. Compact each layer of subgrade backfill or fill soil material at 75 percent.

6. Under catch basins, manholes, vaults or other underground structures.

    a. Scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

3.21 GRADING

A. General: Uniformly grade areas to a smooth surface, free of 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 Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge and within +0” / -1” tolerance of bottom of slab.

3.22 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place granular fill base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place granular fill base course under pavements and walks as follows:

1. Place base course material over subgrade under hot-mix asphalt pavement.

    a. If separation geotextile is shown in details, install on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

2. Shape base course to required crown elevations and cross-slope grades.

3. Place base course 6 inches or less in compacted thickness in a single layer.

4. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

5. Compact 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.

3.23 SUB BASE FOR CONCRETE SLABS-ON-GRADE

A. Place sub base on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact sub base under cast-in-place concrete slabs-on-grade as follows:

1. Place sub base 8 inches or less in compacted thickness in a single layer.
2. Place sub base that exceeds 8 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 8 inches thick or less than 3 inches thick.
3. Compact each layer of sub base to required cross sections and thicknesses to not less than 95 percent of maximum dry density according to ASTM D 4254.

3.24 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections unless otherwise noted.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Inspections and tests:

1. Geotechnical observations: Proof rolling procedures, site preparation, unsuitable soils removal, excavations, footing bearing, and fill placement.

2. Field Density Testing:

a. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Geotechnical Engineer.

b. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1) Fill under Footings: In each compacted fill layer, 1 compaction test for every 30 linear feet of wall may be taken. 1 compaction test may be made under each individual footing.

2) Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 50 feet or less of wall length, but no fewer than two tests.

3) Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

4) Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

c. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3. Laboratory testing for on-site fills:

a. ASTM D 1557 Modified D 698 Standard Proctor compaction curve including sieve analysis.

3.25 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 Geotechnical Engineer or Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill 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 greatest extent possible.

3.26 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

SECTION 31 23 00 - EXPANDED POLYSTYRENE GEOFOAM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Expanded Polystyrene (EPS) Geofoam.

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM D6817 - Standard Specification for Rigid Cellular Polystyrene Geofoam.

1.4 SUBMITTALS, GENERAL

A. Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include product data and technical bulletins including materials, profiles, physical properties, and accessories, including:

1. Manufacturing materials and additives.
2. Preparation instructions and recommendations.
3. Installation methods.

B. Shop Drawings: Include the following:

1. Project specific layout plan, profiles and components.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and installer.
B. Material Test Reports: From a qualified independent agency, submit summary of tests that products comply with specified performance requirements and ASTM D6817.

1.7 CLOSEOUT SUBMITTALS

A. Warranty.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years experience manufacturing similar products.
B. Installer Qualifications: Minimum 2 years experience installing similar products of the scope and complexity required for this project.
C. Source Limitation: Obtain geofoam through single source from single manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's ordering instructions and lead time requirements.

B. Deliver products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

C. Store and handle materials in accordance with the manufacturer’s instructions to avoid damage.

1. Protect from moisture and sunlight prior to installation.
2. Do not expose to open flame or other ignition sources.
3. Do not expose to organic solvents, petroleum products and their vapors.
4. Provide temporary ballast or other restraint prior to and during installation.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.11 WARRANTY

A. Warranty: Manufacturer's standard warranty that products will maintain performance values in ASTM D6817.

1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPANDED POLYSTYRENE (EPS) GEOFOAM

A. EPS Geofoam: Provide EPS geofoam, structural geotechnical engineering fill blocks, in locations and configurations as shown on the drawings and to meet the following properties:

1. EPS 22, 1.5#, Type II in accordance with ASTM D6817:

a. Minimum Density: 1.35 pounds per cubic foot.

b. Compressive Resistance:

1) At 1% Deformation: Minimum 7.3 psi, 1050 psf.
2) At 5% Deformation: Minimum 16.7 psi, 2400 psf.
3) At 10% Deformation: Minimum 19.6 psi, 2820 psf.

c. Elastic Modulus: 730 psi.

d. Flexural Strength: 35.0 psi.

e. Water Absorption, Maximum Total Immersion: 3 percent.

f. Oxygen Index: 24.0 percent.

g. Buoyancy Force: 61.1 pounds per cubic foot.

B. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

1. Insulfoam, A Carlisle Company; Geofoam.
2. Shelter Enterprises, Inc; EPS Geofoam.
3. Thermal Foams Inc; Foam-Control Geofoam.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements to confirm site conditions are within the manufacturer's limits.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Excavate and prepare subgrade in accordance with the manufacturer’s instructions and project documents.
B. Verify engineered depths, product thicknesses, and other conditions which would affect installation.
C. Examine geofoam prior to installation. Reject materials that have been damaged and replace.
D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with the manufacturer's current published instructions, and details and drawings issued for the project.

    1. Conflicts between the manufacturer instructions and project documents shall be resolved in writing prior to construction.

3.4 PROTECTION

A. Protect installed products and surface finishes from damage during construction
B. Remove and legally dispose of construction debris from project site.

END OF SECTION 31 23 00

SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Erosion, sediment and pollution controls as shown on the Drawings and as directed by the Architect to significantly reduce runoff on downstream properties. This includes temporary control measures to mitigate land disruption by other contractors during construction of this project.

2. Erosion, sediment and pollution control includes, but is not limited to, the following:

   a. Standard control measures such as storm structure protection and silt fence.
   b. Off site sediment tracking controls.
   c. Seeding and sodding
   d. Temporary protection for existing vegetation.
   e. Clean up.

3. Comply with the Soil Erosion and Sediment Control (SESC) for this Project in consultation with appropriate local agencies and soil conservation service. Any local or State Agency requirements are considered part of these specifications.

1.3 SUBMITTALS, GENERAL:

A. General; Submit all action submittals and informational submittals required by this section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product listed.

1. Filter fabric and hardware cloth for storm structure protection.
2. Silt fence and silt fence dikes.
3. Straw bales
4. Stakes
5. Soil stabilization fabric for off-site sediment tracking control, Wheel washing equipment.
6. Drop-In Inlet Protection

B. Material Certificates: Materials certificates showing content/mechanical analysis are required for the following products. Also, provide samples as noted.

1. Granular Backfill: Sample.
2. Granular Base Course Material: Sample.
3. Seeding & sodding.
4. No. 4 stone for off site sediment tracking control.
5. 4,000 psi concrete.

1.5 INFORMATIONAL SUBMITTALS

A. Quality Control Submittals

B. Qualifications Certification: Submit written certification or similar documentation signed by applicable subcontractor, Contractor and manufacturer (where applicable) indicating compliance with applicable "Qualifications" requirements specified below in "Quality Assurance" article.

C. Installer Experience Listing: Submit list of completed projects using products proposed for this Project, including owner's contact and telephone number for each project, demonstrating compliance with applicable "Qualifications" requirements specified below in "Quality Assurance" article.

1.6 QUALITY ASSURANCE

A. Perform erosion, sediment and pollution control in compliance with applicable requirements of the New York Standards and Specifications Erosion and Sediment Control and other governing authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store products according to manufacturer's written instructions.

1.8 NOTICES

A. Pre-Construction Conference: Within seven days of start of construction, attend Civil/Structural Preconstruction Meeting. Representatives of all Contractors responsible for earthwork operations are required to attend.

B. When the site has been finally stabilized, Contractor will notify the Architect, in writing, that a final inspection be performed.

C. Pay any fines issued by any agency as a result of non-compliance with the SESC Plans.

1.9 INSPECTIONS AND MAINTENANCE

A. The Architect or qualified personnel of the Owner shall inspect disturbed areas of the construction site. Special attention will be focused on areas not finally stabilized, structural control measures, and locations where vehicles enter or exit the site. Disturbed areas will be inspected for pollutants entering the drainage system. Structural control measures will be reviewed for effectiveness in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site will be inspected for evidence of off-site sediment tracking.

B. Provide timely maintenance of vegetation erosion and sediment control measures, and other protective measures, during construction.

C. Perform corrective measures within three calendar days of the Architect's or Owner's report at no cost to the Owner. Failure by the Contractor to perform corrective work within this schedule automatically authorizes the Owner to hire others and deduct from the Contract Sum the costs incurred by the Owner for the performance of this Work.

PART 2 - PRODUCTS

2.1 STORM SEWER PROTECTION

A. 1/2-inch mesh hardware cloth covered with a polypropylene silt fence fabric (see below).

2.2 STRAW BALES

A. Shall be clean, free of dirt, hay, grass, or weeds.
B. Bound with twine or wire.
C. Bales, when placed, shall be dry and capable of passing water.

2.3 SILT FENCE

A. Meet the following criteria unless specific type is shown on plans or Architect accepts the change in criteria.

1. Silt Fence: Polypropylene filter fabric supported by non-pressure treated hardwood posts meeting the following requirements.

Property	Unit	Test Method	Value
Grab Tensile Strength (Machine Direction)	lbs	ASTM D 4632	124 min
Grab Tensile Strength (Cross-Machine Direction)	lbs	ASTM D 4632	124 min
Grab Tensile Elongation	%	ASTM D 4632	15 / 15
Trapezoid Tear Strength	lbs	ASTM D 4533	65 min
Mullen Burst Strength	psi	ASTM D 3786	300 min
Puncture Strength	lbs	ASTM D 4833	60
Ultraviolet Stability (Strength Retained)	%	ASTM D 4355	70
Apparent Opening Size (AOS)	U.S. Sieve	ASTM D 4751	30

Permittivity	sec^{1}	ASTM D 4491	0.10
Coeff of Permeability	CM/Sec	ASTM D 4491	0.005 min
Water Flow Rate	$gal/min/ft^{2}$	ASTM D 4491	10 min

2. Basis of Design Product: Subject to compliance with requirements provide Tencate Geosynthetics Mirafi 100X fabric or comparable product.

3. Reinforced fence: Fabric backed with 14-1/2 gauge by 6 inch square mesh woven wire. See plans and details for specific locations or requirements.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. DGI Industries.
2. Hanes Geo Components.
3. TenCate Geosynthetics (Mirafi).

2.4 STAKES

A. One of the following:

1. 2-inch by 2-inch nominal by 4-feet long, non-pressure treated hardwood.
2. #4 rebar, 4-feet long min.

B. Maximum post spacing permitted shall be: 8’4” O.C.

2.5 SEEDING AND SODDING

A. Refer to applicable section.

2.6 TEMPORARY SEEDING (unless otherwise shown on Drawings):

A. Minimum Requirements:

1. Lime: 1/2 ton per acre.
2. Fertilizer: Commercial 5-10-10 or equivalent (600 lbs per acre).
3. Seed: Ryegrass (annual or perennial) (40 lbs. per acre).
4. Mulch: Straw at 2 ton per acre.

2.7 STABILIZED CONSTRUCTION ENTRANCE

A. No. 4 stone meeting the following requirements:

Standard ASTM Sieve Size	Percent Passing by Weight
4 inch	100
3 inch	90-100
2 inch	0-15
Passing No. 50	5-10
Passing No. 100	2-5

B. Soil Stabilization Fabric:

1. Stabilization Fabric: Commercially manufactured, UV stabilized low clogging, high flow, woven geotextile meeting the following requirements.

Property	Unit	Test Method	Value
Grab Strength	lbs	ASTMD-4632	315 min
Tensile Strength	lbs/in	ASTMD-4595	175 min
Grab Elongation	%	ASTMD-4632	15 max
Trapezoid Tear	lbs	ASTMD-4533	120 min
Mullen Burst	psi	ASTMD-3786	600 min
Permittivity	/Sec	ASTMD-4491	.05min
Water Flow Rate	gal/min/ft^2	ASTMD-4491	4 min

2. Basis of Design Product: Subject to compliance with requirements provide Tencate Geosynthetics Mirafi 600X fabric or comparable product.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. DGI Industries.
   b. Hanes Geo Components.
   c. TenCate Geosynthetics (Mirafi).

C. Granular Base Course Material: Shall be as specified in Earth Moving Section.

2.8 TEMPORARY TREE PROTECTION

A. Stakes: shall be a 2 inch by 4 inch by 6 feet (min) non-pressure treated hardwood.

B. Top Rail: shall be 2 inch x 4 inch x 8 feet (max) non-pressure treated hardwood fastened to stakes by nails or screws.

C. Fabric: Heavy duty orange construction barrier fencing similar to “Sentry HD” fencing by Tenax Corporation Baltimore Maryland. Fabric shall be attached to the stakes and top rails with staples or other fasteners.

2.9 DROP-IN INLET PROTECTION:

A. Standard of quality for aftermarket inlet protection for use in existing and proposed catch basin, drop inlets, curb box inlets and storm manholes shall be Flexstorm Inlet Filters, by Inlet and Pipe Protection, Inc., Naperville, Illinois.

1. Description of System:

a. An aftermarket drop-in inlet filter system designed to collect silt and sediment from surface storm water runoff at drainage locations shown on the plans, at existing inlets in pavement where adjacent disturbance will allow sediment runoff to occur, in areas where access to the site dictates their use due to phasing issues, or as directed by the Engineer.

b. An aftermarket drop-in inlet filter system comprised of a corrosion resistant steel frame and a replaceable geotextile sediment bag attached to the frame with a stainless steel locking band. The sediment bag hangs suspended from the rigid frame at a distance below the grate that shall allow full water flow into the drainage structure if the bag is completely filled with sediment.

c. The aftermarket drop-in inlet filter frame includes lifting handles in addition to the standard overflow feature. A proprietary Removal Tool engages the lifting bars or handles to allow manual removal of the assembly without machine assistance. The frame suspension system is adjustable in ½" increments up to 5" per side on rectangular designs should the casting or drainage structure have imperfections.

d. Standard woven polypropylene sediment bags with a typical flow rate of 200 gpm / sq ft.

2. Woven Sediment Bag Material Specifications:

		MARV[2]	
PROPERTY	TEST METHOD	ENGLISH	METRIC
Mechanical			
Tensile Strength (Grab)	ASTM D-4632	255 x 275 lbs	1130 x 1220 N
Elongation	ASTM D-4632	20 x 15 %	20 x 15 %
Puncture	ASTM D-4833	135 lbs	600 N
Mullen Burst	ASTM D-3786	420 psi	2890 kPa
Trapezoidal Tear	ASTM D-4533	40 x 50 lbs	175 x 220 N
Endurance			
UV Resistance	ASTM D-4355	90%	90%
Hydraulic			
Apparent Opening Size (AOS)[3]	ASTM D-4751	20 US Std. Sieve	0.850 mm
Percent Open Area (POA)	CW-02215 Mod.[4]	20%	20%
Permittivity	ASTM D-4491	1.50 sec^{-1}	1.50 sec^{-1}
Water Flow Rate	ASTM D-4491	200 gpm/ft^2	8,145 $l/min/m^2$

3. Tested Filtration Efficiency:

a. All testing performed in general accordance with the ASTM D 7351, *Standard Test Method For Determination of Sediment Retention Device Effectiveness in Sheet Flow Application*, with flow diverted into an area inlet. Test Soil used as sediment had the following characteristics with a nominal 7% sediment to water concentration mix:

Soil Characteristics	Test Method	Value
% Gravel	ASTM D 422	2
% Sand		60
% Silt		24
% Clay		14
Liquid Limit, %	ASTM D 4318	34
Plasticity Index, %		9
Soil Classification	USDA	Sandy Loam
Soil Classification	USCS	Silty Sand (SM)

Tested Efficiencies:

Property	Woven Sediment Bag
Filtration Efficiency	82%

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which soil erosion and sediment control is to be installed notify Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Beginning installation constitutes Contractor's acceptance of substrate and conditions.

3.2 GENERAL EROSION CONTROL

A. Install initial construction erosion control features, as indicated on SESC Drawings and Specifications or as directed by the Architect, prior to topsoil stripping, earthwork, and removal of existing vegetation. Keep the disturbance to a minimum. Install other features as described in the sequence of erosion, sediment and pollution control on the drawings.

B. Minimize amount of bare soil exposed at one time. Cumulative disturbance in excess of one acre requires coverage under NYSDEC SPDES Permit for Construction Activities.

C. Start permanent seeding within seven calendar days of rough grading. When this is not possible, provide temporary seeding of perennial rye grass at the rate of three pounds seed per one thousand square feet. Provide temporary seeding within seven days on non-roof, non-paved areas. When adverse weather conditions prevent good germination, repeat seeding as directed by the Architect until the area is stabilized. Till under temporary grass and fine grade when preparing for final seeding.

D. Until a disturbed area is stabilized, trap runoff sediment by the use of debris basins, sediment basins, silt traps, or other methods acceptable to the Architect and governing authorities. Construct sediment basins to dimensions shown on plans.

E. Place stone filters in accordance with dimensions shown on Drawings. If filters become plugged or partially plugged, remove and replace the stone. Cleaning of stone will only be allowed when method is reviewed by Owner Representative and found acceptable.

F. Provide erosion controls on slopes and swales traversing, bordering, or leaving the site. Limit the water flow to a non-erosive velocity.

G. Do not store fill materials within fifty feet of the banks of any streams or water bodies, intermittent or perennial.

H. Provide temporary protection for Trees and Shrubs as outlined and shown on Drawings and elsewhere in this Section.

I. Inspect erosion and sediment control measures immediately after each rainfall and at least daily during prolonged rainfall. Make required repairs immediately.

J. Remove sediment deposits when they reach approximately one-half of the height of the barrier. Dispose sediment in a manner that does not result in additional erosion or pollution.

K. Provide prompt removal and disposal of rubbish and debris in accordance with the governing authorities.

L. Coordinate temporary erosion and sediment control measures with permanent erosion control features specified elsewhere in the Contract Documents to the maximum extent possible to assure economical, effective, and continuous erosion control.

M. Remove all temporary measures at completion of construction.

3.3 MUNICIPAL SEWER AND WETLAND EROSION CONTROL

A. Control erosion, siltation and pollution to municipal sewers, water bodies and wetlands by taking appropriate measures such as, but not limited to, the following:

1. Prevent petroleum products and excessive amounts of silt, clay, and muck from entering municipal sewers, waters or wetlands of New York State during construction.

2. Prevent fresh concrete, concrete leachate and washings from equipment and trucks, from entering municipal sewers, waters or wetlands of New York State during construction.

3. Place silt fence to control erosion at the down slope edge of disturbed areas. Place this barrier to sediments before disturbance of the ground occurs and maintain in good condition until disturbed land is heavily vegetated or otherwise permanently stabilized.

4. Seed areas of soil disturbance resulting from this Project with appropriate perennial grass seed and mulch with straw within seven calendar days as described in general erosion control. Maintain mulch until a suitable vegetative ground cover is established.

3.4 STORM STRUCTURE PROTECTION

A. As shown on the Soil Erosion and Sediment Control Plans (SESC), provide storm structure protection at each inlet as shown on the detail plan. Clean storm structure protection material after each storm event to permit the fabric and/or drainage stone to work effectively. Remove the drainage material when the site is stabilized and approved by the Architect.

3.5 SILT FENCE/STRAW BALE DIKES

A. Locate in accordance with plans and details and as directed by the Architect. Excavate trench along the lower perimeter(s) of site, along the contract limit line, and as indicated on the Drawings. The placement of silt fence and/or bales shall consider drainage paths and intercept drainage prior to leaving site or entering storm system. Place excavated material on uphill side of trench for backfilling.

B. Drive stakes securely into the downhill side of the trench. When prefabricated silt fence with fabric attached to stakes is used, drive stakes so that fabric is buried in the ground as detailed.

C. Backfill trench with excavated material, so that fabric is securely buried in the ground to prevent undermining. Tamp soil.

D. Join sections by overlapping fabric between two stakes. Set stakes simultaneously. Overlap by minimum six inches, fold, and staple to prevent sediment bypass.

E. Attach silt fence securely to stakes spaced no more than eight feet on center. Secure fence fabric to stake with minimum three one inch staples.

F. Provide silt fence dikes perpendicular to swale center lines in swales one and one half percent and steeper. Locate dikes at a maximum interval of fifty feet on center unless otherwise shown on drawings.

G. Removal of silt and replacement of silt fence and/or bales shall be on going throughout the duration of the project to maintain an effective silt removing barrier.

3.6 TEMPORARY SEEDING

A. When necessary, provide temporary seeding as described in this Section.

B. Seedbed Preparation:

1. Scarify soil if compacted.
2. Remove debris and obstacles such as rocks and stumps.
3. Apply lime and fertilizer.
4. Apply seed uniformly by mechanical seeder or hydroseeder.
5. Apply straw mulch.

C. Provide permanent seeding as described elsewhere in the Contract Documents.

3.7 OFFSITE SEDIMENT TRACKING CONTROLS

A. Stabilization Blanket: Install as detailed and shown on Drawings to eliminate tracking sediment off site. Inspect after each rain storm and at least one time per week. When sediment begins tracking off site, immediately replace stone with clean No. 4 stone to retain sediment on site. Remove fabric and stone at project completion. Complete construction of proposed final surface(s).

3.8 DROP-IN INLET PROTECTION

A. Install channel drain inlet matting per manufacturer's installation requirements.
B. Clean silt from filter bag following each rain event and as required. Do NOT allow accumulated sediment to enter the inlet.

3.9 TREE PROTECTION

A. Temporary Protection for Trees and Shrubs:

1. Provide temporary fencing, barricades or guards as required to protect trees and other plants, which are to remain, from above ground damage.

2. Protect root system from smothering. Do not store construction materials, debris, or excavated material within drip line (outer perimeter of branches). Do not permit vehicular traffic or parking within drip line. Restrict foot traffic to prevent excessive compaction of soil over root systems.

3. Should any trees or shrubs be damaged which are to be saved, arrange to have such damage treated by a licensed arborist or tree surgeon.

4. Trees or shrubs which die because of the Contractor's failure to conform to the Drawings and specifications shall be evaluated by a qualified organization selected by the Owner's Representative. The removal and replacement of the tree, and the evaluation expenses shall be paid for by the Contractor. Contractor shall be required to replace the damaged tree with plant material of comparable size and quality (i.e. damaged 12 inch caliper Red Maple shall be replaced by three 4 inch cal. or four 3 inch cal. Red Maples). Substitutions for variety shall be approved by the Architect

3.10 CLEANING

A. During the Contract and at intervals as directed by the Architect and as erosion, sediment and pollution control procedures are completed, clear the site of extraneous materials, rubbish, and debris. Leave the site in a clean, safe, well draining, and neat condition.

B. Clean storm ponding areas, catch basins, detention basins, and Oil and Grit Separator(s): Clean out contaminants, sediment, rubbish, construction debris, foreign objects and accumulated floatables from chambers and ponding areas thoroughly, immediately prior to final acceptance.

END OF SECTION 31 25 00

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
B. The principal reference for materials and methods is the “New York State Department of Transportation Standard Specifications for Construction and Materials,” latest edition (NYSS).

1.2 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.
2. Pavement-marking paint.

B. Related Sections:

1. Section 31 20 00 "Earth Moving" for subgrade and aggregate base preparation and other requirements.

1.3 SUBMITTALS

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

a. Job-Mix Designs: For each job mix proposed for the Work.

C. Qualification Data:

1. Asphalt Paving Installer Experience Listing: Submit list of completed projects using products proposed for this Project demonstrating compliance with applicable requirements specified below in “Quality Assurance” article.

2. Manufacturer’s Certificates: Certify that hot mix asphalt products meet or exceed NYSDOT Standard Specifications:

a. Section 401: Plant Production
b. Section 402: Hot Mix Asphalt (HMA) Pavements
c. Section 407: Tack Coat
d. Section 685: Pavement Markings

1.4 QUALITY ASSURANCE

A. Manufacturer and Mixing Plant Qualifications: A paving-mix manufacturer and mixing plant with NYSDOT approved materials and batch plant equipment complying with the following NYSDOT Standard Specifications:

1. Section 401: Plant Production
2. Section 402: Hot Mix Asphalt (HMA) Pavements.

B. Asphalt Paving Installer: Company specializing in performing work described in this section with minimum experience of three years.

C. Permits: Submit certified copies of all permits obtained from local regulatory agencies and New York State Department of Transportation.

D. Installation Requirements: Work to be performed in accordance with the following NYSDOT Standard Specifications:

1. Section 402: Hot Mix Asphalt (HMA) Pavements
2. Section 407: Tack Coat

1.5 REGULATORY REQUIREMENTS

A. Obtain written permission and required permits from applicable agency prior to start of construction, and submit copies of permits as specified in "Submittals - Quality Control Submittals" above.

1.6 PROJECT CONDITIONS

A. Temperature and Seasonal Limitations: Refer to NYSDOT 402-3.01 Temperature and Seasonal Limitations.

1. Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, if the temperature has not been above 35 deg for 12 hours immediately prior to application or if the following minimum surface temperatures are not met.

2. Minimum Surface Temperatures: Comply with NYSDOT Standard Specifications Section 402, table 402-1 – Temperature Requirements.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature in accordance with NYSDOT Standard Specifications Section 685-3.02 – Atmospheric Conditions.

PART 2 - PRODUCTS

2.1 AGGREGATE SUBBASE AND BASE FOR ASPHALT PAVING

A. Refer to Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

2.2 ASPHALT PAVING MIX AGGREGATES

A. Aggregates for binder and top course: Conform to the requirements of NYSDOT Standard Specification 401-2.02, Aggregates.

2.3 ASPHALT MATERIALS

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes meeting NYSDOT Standard Specifications, Section 402 (70 Series) for each pavement course and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Mixes to be placed at thickness noted on the Drawings.
3. Binder Course (2-in < t < 3-in): NYSDOT No. 402.197904 (Type 3 Binder). Maximum 20% RAP permitted.
4. Binder Course (3-in < t < 5-in): NYSDOT No. 402.257904 (Type 3 Binder). Maximum 20% RAP permitted.
5. Shim Course: NYSDOT No. 402.058904 (Type 5 Shim). Maximum 20% RAP permitted.
6. Top Course: NYSDOT No. 402.097304 (Type 7.) Maximum 20% RAP permitted.
7. Top Course: NYSDOT No. 402.097104 (Type 7F.) Maximum 20% RAP permitted.

B. Coatings/Fillers: Comply with New York State Department of Transportation Standard Specification, Section 702 for material designations indicated.

1. Tack Coat: Emulsified asphalt

a. Slow setting type; NYSDOT Designation 702-3601 (SS-1h) or 702-4501 (CSS-1h).
b. Medium setting type; NYSDOT Designation 702-3401 (HFMS-2H) or 702-4301 (CMS-2h)

2. Asphalt Cement Filler: NYSDOT Designation 702-0700.

C. Water: Potable.

2.4 PAVEMENT MARKING PAINT

A. Complying with NYSDOT Standard Specifications:

1. Section 727-09: White and Yellow Solvent Borne Acrylic Permanent Traffic Paint

2. Colors:

a. White for asphalt striping and signage

1) Lane Markings for traffic in the same direction

b. Yellow for traffic markings

1) No parking parent / bus drop-off zones
2) No parking fire lanes
3) Lane Markings for opposing traffic
4) Parking Stalls – Confirm with owner

c. Blue for the following locations:

1) ADA Accessible symbol and associated ADA Accessible striping

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. TM 5626 White Setfast Acrylic Traffic Marking Paint, Sherwin Williams Company, Baltimore, MD
b. TM 5627 Yellow Setfast Acrylic Traffic Marking Paint, Sherwin Williams Company, Baltimore, MD
c. TM 2133 Blue Setfast Latex Traffic Marking Paint, Sherwin Williams Company, Baltimore, MD

B. Pavement Striping Blackout Paint: Opaque, high quality, exterior grade primer compatible with existing asphalt surface and pavement marking paint.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. TM 5629 Black Setfast Acrylic Traffic Marking Paint, Sherwin Williams Company, Baltimore, MD

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.

3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

a. Subsurface preparation shall conform to the appropriate section of NYSS.

4. After rolling, test course with straight edge min. 15 ft. long. Satisfactorily eliminate any depression over 1/4" deep.

5. Proceed with paving only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 SAWCUTTING

A. Saw cut existing pavement perpendicular to the roadway surface in neat lines. If the pavement breaks irregularly along the cut line during removal, saw cut the entire length of pavement again to achieve one uniform, straight, and neat line.

3.3 TACK COAT

A. Apply in accordance with NYSDOT Standard Specifications Section 407-3.02.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

B. Manhole and Catch Basin Frames and Grates:

1. Coat surfaces of frames and grates with oil to prevent asphalt adherence to surfaces. Do not tack coat.

3.4 PATCHING

A. Hot-Mix Asphalt Pavement:

1. Preparation: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending the minimum distance shown on Drawings into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade. Apply tack coat.

2. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3. Use hot-applied joint sealant to seal new joints. Fill flush with surface of existing pavement and remove excess.

3.5 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Herbicide Application: Obtain approval of Owner before herbicide notification or application. Notify Owner’s designated pesticide representative and all property neighbors not less than 48 hours in advance of any pesticide application including all herbicides, insecticides and fungicides in accordance with the School Pesticide Neighbor Notification Law, Section 409-h of New York State Education Law and Commissioner's Regulation 155.24.

C. Tack Coat: Apply tack coat.

3.7 HOT-MIX ASPHALT PLACING

A. Hot-Mix Asphalt Paving Application: Provide finished surface free from depressions that could collect water. Satisfactorily remove, at Contractor's expense, any depressions over 1/8" when tested with 6-foot straight edge without evidence of patching. Carry all paving to wood stripping, curbing or to location shown on Drawings.

B. Application Over Aggregate Base:

1. Heavy Duty Asphalt Areas: Apply over aggregate base in 2 courses. Comply with New York State Department of Transportation Standard Specification, Section 401 and Section 402, for asphalt types specified.

C. Placement: 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. Spread mix at minimum temperature of 250 deg F.
3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

D. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

E. 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.

3.8 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.

3. Offset transverse joints, in successive courses, a minimum of 24 inches.

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

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.

7. Use hot-applied joint sealant to seal new joints. Fill flush with surface of existing pavement and remove excess.

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus 1/2 inch, no minus.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.

C. Pavement Surface Drainage: Pavement is to drain to catch basin, swale or other storm drainage control measure as indicated on Drawings or, if not indicated on drawings, to nearest storm drainage control measure.

D. Pavement Remediation: If pavement surface smoothness and drainage requirements above are not met, correct to meet tolerance and performance requirements. If remediation is not acceptable to Architect, removal and replacement of area will be required. Feather and smooth edges of correction measure so that joint is invisible.

3.11 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Perform work in accordance with NYSDOT Standard Specifications Section 727-09.

C. Sweep and clean surface to eliminate loose material and dust.

D. Surface must be clean, dry and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

E. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended application conditions (temperature, dew point, humidity) and rates to provide a minimum wet film thickness of 15 mils and minimum dry film thickness of 7.5 mils.

F. Do not apply pavement marking paint to concrete surfaces with concrete sealers or efflorescence. Remove by extended weathering, etching, or abrasive blasting.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
D. Replace and compact hot-mix asphalt where core tests were taken.
E. 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 CLEANING AND DISPOSAL

A. Paver and Equipment Cleaning:

1. Do not clean tools and equipment used for HMA placement on the pavement surface, or near streams, ponds, drainage structures or other areas that are tributaries to waterways.

2. Use an area approved by the Owner's Representative for cleaning all paving equipment and tools.

    a. If possible, remove solid pieces of asphalt by scraping or other mechanical means prior to application of a cleaning agent.

3. If a petroleum product is used for cleaning, contain all liquid products during cleaning operations using tarpaulins, sand pads, pails, or other collection methods to prevent spillage or accidental release.

    a. Use hand sprayers or other similar devices to minimize the amount of petroleum product applied.

4. Properly dispose of sand and collected petroleum products as petroleum contaminated soil at no additional cost to the Owner.

B. Remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 32 12 16

SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sidewalks..
2. Curbs.
3. Joint Sealant.
4. Concrete Sealer.
5. Curing materials.
6. Joint forming materials.
7. Joint Filler.
8. Sealers
9. Detectable Warning Materials.
10. Colored Concrete.
11. Imprinted and Textured Concrete.

B. Related Sections:

1. Section 03 30 00 "Cast-in-Place Concrete" general concrete mix, materials, installation and building-related concrete requirements.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Refer to Div 03 concrete section for concrete submittal requirements, material certificates, installer qualification data and other required action and informational submittals.

1.4 ACTION SUBMITTALS

A. Provide Product Data and Testing Information for each type of product indicated.

1. Forms
2. Form release agent
3. Sealer
4. Joint Sealant
5. Curing Compound

6. Expansion Joint Material
7. Expansion Joint Forming System
8. Detectable Warning Materials
9. Concrete Color Materials, Sealant, Curing Compound and Joint Sealant
10. Concrete Stamping Materials and Release Agents

1.5 SHOP DRAWINGS

A. Jointing Plan: Provide shop drawing showing concrete joint layout, specifically indicating the locations of expansion, tooled and control joints.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer. (Refer to Div 03 concrete section for requirements.)
B. Qualification data for colored concrete supervisor.
C. Qualification data for colored concrete installer.

1.7 QUALITY ASSURANCE

A. For Installer and Manufacturer requirements, refer to Div 03 concrete section**.**

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship in the location and of the size indicated where directed by Architect and not less than 96 inches by 96 inches.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. For colored, textured and/or stamped concrete installer:

1. Provide qualified supervisor that has completed at least five colored, stamped projects similar in scope to this project. Provide minimum of three references for above projects.
2. Colored textured stamped concrete installer to be certified by approved concrete color manufacturer. Provide copy of certification to Architect.

D. Mock-up for Colored Concrete: Provide 48”x48” minimum size mock-ups for each color, texture and finish. Location to be designated by Architect and Owner. Do not proceed with remaining work until workmanship, color and finish are approved by Architect. Refinish mock-ups as required to produce acceptable work.

1.8 PREINSTALLATION MEETING

A. Concrete Paving Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place architectural concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.

2. Review concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural concrete.

1.9 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 Refer to Div 03 concrete section for products, unless noted below.

2.2 FORMS

A. Form Materials: Metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 CONCRETE MATERIALS

A. Refer to Div 03 concrete section for cementitious material, aggregates, admixtures, and other concrete materials.

2.4 CURING MATERIALS

A. Standard Concrete Curing Compound: Clear, Waterborne, Membrane-Forming Curing Compound in accordance with ASTM C 309, Type 1-D, Class B, dissipating, with fugitive dye. Minimum 2-coats required.

B. Colored / Stamped Concrete Curing Compound: Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
2. BASF Construction Chemicals - Building Systems; Kure-N-Seal 25 LV.
3. ChemMasters; Spray-Cure & Seal Plus.
4. Meadows, W. R., Inc.; CS-309/30.

2.5 SEALER

A. Standard Concrete Sealer: Penetrating, Silane Sealer: Single component, 40% silane, waterbased slab sealer that forms chemical bond to the concrete. VOC compliant.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Construction Chemicals; MasterProtect H 400.
    b. Chem Masters; Aquanil Plus 40.
    c. Dayton Superior Corporation; Weather Worker 40% J29WB.

B. Colored/Stamped Concrete Sealer: Solvent-Borne, Membrane-Forming Sealing Compound: To be compatible with integral and color-hardened concrete system.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Construction Chemicals, www.master-builders-solutions.basf.us/en-us/contact
    b. The Bomanite Company, www.bomanite.com
    c. L.M. Scofield Company, www.scofield.com

2.6 JOINT SEALANT

A. Joint Sealant: Two-part, elastomeric polyurethane or polysulfide-based pourable self-leveling joint sealant complying with ASTM C 920, Type M, Grade P, Class 25, NT and CRD-C-506, Type 1, Classes A & B.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic SL 2.

1) Color for uncolored concrete: Limestone.
2) Color for colored concrete: Custom color to match colored concrete.

b. W.R. Meadows, Inc.; Deck-O-Seal Sealant.

1) Color for uncolored concrete: Stone Gray.
2) Color for colored concrete: Custom color to match colored concrete.

2.7 EXPANSION JOINT MATERIALS

A. Expansion/Isolation-Joint-Filler Strips: ½-inch rigid, extruded polystyrene insulation (at exterior walls) ASTM D 1751; asphalt-saturated cellulosic fiber, or ASTM D 1752.

B. Plastic Expansion Joint Forming System ("Zip-Strip"): Plastic joint form plus cap.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following: (inserted space)

a. W.R. Meadows, Inc.; Snap-Cap.

2.8 INTEGRALLY COLORED CONCRETE

A. Color Pigment: Refer to Div 03 concrete section for integral concrete coloring product requirements.

1. Color: As selected by Architect from manufacturer's full range.

B. Colored Concrete Sealer: Solvent-Borne, Membrane-Forming Sealing Compound - To be compatible with integral and color-hardened concrete system.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. The Bomanite Company, www.bomanite.com
b. L.M. Scofield Company, www.scofield.com

C. Colored Concrete Curing Compound: Solvent-Borne, Membrane-Forming Curing and Sealing Compound in accordance with ASTM C 1315, Type 1, Class A. For use with stamped concrete only.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Construction Chemicals - Building Systems; Kure-N-Seal 25 LV.
b. ChemMasters; Spray-Cure & Seal Plus.
c. Meadows, W. R., Inc.; CS-309/30.

2.9 PIGMENTED COLOR HARDENER

A. Pigmented Mineral Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. The Bomanite Company, www.bomanite.com
    b. L.M. Scofield Company, Lithochrome system, www.scofield.com

2. Color: As selected by Architect from manufacturer's full range.

B. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Construction Chemicals, LLC; Mastercron.
    b. ChemMasters; ConColor.
    c. Dayton Superior Corporation; Quartz Tuff.
    d. Lambert Corporation; COLORHARD.
    e. Scofield, L. M. Company; LITHOCHROME Color Hardener.

2. Color: As selected by Architect from manufacturer's full range.

2.10 IMPRINTED CONCRETE MATERIALS

A. Imprinting Tools: Mat type imprinting tools for texturing freshly placed concrete, in multiple patterns and textures as selected by Architect from full range of patterns and textures.

1. Refer to plans for patterns and textures.

B. Imprinted Concrete Liquid Form Release Agent: Dissipative form release agent, manufactured by or compatible with coloring system.

1. Finish: Clear or “antique” finish, as chosen by Architect.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. The Bomanite Company, www.bomanite.com
    b. L.M. Scofield Company, www.scofield.com

2.11 DETECTABLE WARNING MATERIALS

A. Ductile iron detectable warning surface plates - for handicap accessible concrete curb ramps: Ductile iron, permanently embedded, wear and corrosion resistant 18-inch/24-inch/30-inch x 24-inch ductile iron plates with raised truncated domes complying with ADA and the NYS Building Code, having a skid resistance coefficient of friction greater than 0.8.

1. Physical Properties:

   a. Slip Resistance ..... 1.10 Dry/1.06 Wet per ASTM C-1028
   b. Wear Resistance ..... 7333 per ASTM C-501-84
   c. Impact Resistance..... > 238 Newtons per ASTM D-1709
   d. Bond Strength Adhesion to Concrete..... > 5000 lbs per ASTM D-482
   e. Tensile Strength..... > 35000 lbs per ASTM A-48
   f. Design Compliance ..... Full Compliance with ADAAG / DOT

2. Hardware:

   a. Manufacturer approved stainless steel hardware for bolting plates together

3. Coating:

   a. Shop-dip applied black asphaltic coating.

4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. East Jordan Iron Works, Inc. (EJIW): Duralast Cast Iron Detectable Warning Plates.

2.12 CONCRETE MIXTURES

A. Refer to Div 03 concrete section for concrete mixtures.
B. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving in accordance with Section 31 20 00 “Earth Moving”. Identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

3.4 STEEL REINFORCEMENT

A. Refer to Div 03 concrete section for steel reinforcement.

3.5 JOINTS

A. General: Form construction, expansion/isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

2. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Expansion / Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 30 feet maximum unless otherwise indicated.

2. Extend joint fillers full width and depth of joint.

3. Plastic Expansion Joint Forming System ("Zip Strip"). Install so that cap of channel is flush with surrounding concrete pavement. Install per manufacturer's installation instructions. Remove plastic cap after concrete is cured.

4. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

D. Control / 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, to match jointing of existing adjacent concrete paving unless otherwise noted:

1. Tooled / Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

2. Tooled / Grooved and Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks. Sawed joints without tooling are not allowed.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Refer to Div 03 concrete section for concrete placement information.

B. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

C. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

D. 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.

E. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

F. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, (4.3.2.1 Slump Adjustment).

1. With each concrete mixture submittal, indicate amounts of mixing water to be withheld for later addition at Project site.

2. Water added must not increase the water-cement ratio past the approved mix design ratio.

3. Add additional water reducer or plasticizer to mix instead of adding water to achieve flowable, workable concrete. Do not add water to concrete after adding these admixtures to mixture.

4. Do not add water after truck is more than half empty.

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. Screed paving surface with a straightedge and strike off.

J. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

K. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

L. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface 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. 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.

C. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft., unless greater amount is recommended by manufacturer to match paving color required.

2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.

3. After final power floating, apply a hand-trowel finish followed by a broom finish.

4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.8 DETECTABLE WARNINGS

A. Cast Iron Detectable Warning Surface Plates:

1. Connection: Fasten plates together with stainless steel bolts per manufacturer's torque requirements.

2. Setting Plates: Set cast iron detectable warning plates into wet concrete in accordance with ADAAG (American Disabilities Act and Accessibility Guidelines). Tamp plates thoroughly with rubber mallet until concrete seeps through vent holes.

3. Clean off excess concrete from the plate(s) and adjust adjacent concrete to be flush with plates. Finish concrete around plates to match surrounding concrete.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 and 305R for hot-weather protection during curing.

B. Slabs: Protect slabs within building from precipitation accumulation. Immediately remove water, snow or ice from surface of slabs within building regardless if source is from precipitation, construction activities, etc.

C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. 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. Formed Surfaces: Cure formed concrete surfaces, including supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

E. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

F. Cure concrete according to ACI 308.1:

1. 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.

G. Apply penetrating, silicane sealer or curing and sealing compound for stamped concrete per manufacturer's instructions. Do not use silicane sealer on stamped concrete.

3.10 FIELD QUALITY CONTROL

A. Refer to Div 03 concrete section for field quality control information.

1. Contractor Requirements:

a. Provide access to concrete construction for representatives of testing agency employed by Owner to perform concrete testing.
b. Notify Architect at least four days in advance of each concrete placement to allow notification of Owner's testing agency.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Chain-link fences.
2. Gates: Swing.
3. Privacy Slats.

B. Related Sections:

1. Section 03 30 00 “Cast-in-Place Concrete”
2. Section 31 20 00 "Earth Moving"

1.3 REFERENCES

A. ASTM A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
B. ASTM F552 Standard Terminology Relating to Chain Link Fencing.
C. ASTM F567 Standard Practice for Installation of Chain Link Fence.
D. ASTM F626 Specification for Fence Fittings.
E. ASTM F900 Specification for Industrial and Commercial Swing Gates.
F. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
G. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates.
H. CLFMI WLG2445 Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing.

1.4 PERFORMANCE REQUIREMENTS

A. Design Wind Load: Comply with applicable requirements of building code in effect for Project including applicable portions of ASCE 7 for Wind Load Pressure and CLFMI WLG 2445 Wind Load Guide for the Selection of Line Post Spacings.

1.5 SUBMITTALS

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

a. Fence and gate posts, rails, and fittings.

b. Chain-link fabric, reinforcements, and attachments.

c. Polymer and polyester coatings.

1) Note: Polymer and polyester coated samples and product data are to be submitted simultaneously.

d. Accessories:

1) Privacy slats

e. Gates and hardware.

2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

3. Samples for Verification:

a. Polymer and Polyester Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

1) Note: Polymer and polyester coated samples and product data are to be submitted simultaneously.

b. Manufacturer's color charts.

4. Warranty:

a. Sample of special warranty
b. Sample of manufacturer warranty

C. Informational Submittals:

1. Qualification Data: Submit list of completed projects using products proposed for this Project, including owner's contact and telephone number for each project, demonstrating compliance with "Quality Assurance" article.

2. Product Test Reports: For framing strength according to ASTMF 1043.

D. Closeout Submittals:

1. Operation and Maintenance Data: For the following to include in operation and maintenance manuals:

a. Polymer and polyester finishes.
b. Gate hardware.

2. Warranty: Executed special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Minimum five (5) years' experience in installing chain link fences and gates similar in material, design, and extent to that indicated for this Project in accordance with ASTM F 567, whose work has resulted in construction with a record of successful performance.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.8 WARRANTY

A. Special Warranty: Contractor's warranty to repair or replace components of chain-link fences and gates that fail in materials or workmanship within the specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of any component of fence to perform as designed.
b. Faulty operation of gate(s) to perform as designed.

2. Warranty Period: Five (5) years from date of Substantial Completion.

B. Manufacturer warranty: Manufacturer's standard form in which Contractor agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of metals, metal finishes, coatings and other materials of the fence components, including fabric, framework and fittings.

2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle. Comply with CLFMI Product Manual and with requirements indicated below:

1. Fabric Height: As indicated on Drawings.

2. Steel Wire Fabric:

a. General Use: Wire with a diameter of 0.148 inch (9 gauge) minimum. For polymer coated fabric, wire with a diameter of 0.148 inch core (9 gauge core) minimum.

3. Mesh Size:

a. General Use: 2 inches, unless noted otherwise.

4. Coatings:

a. Polymer-Coated (Vinyl) Fabric: ASTM F 668, Table 4, Class 2b, fused and adhered over zinc-coated steel wire.

1) Color: As selected by Architect from manufacturer's full range, complying with ASTM F 934.

2) Basis of Design Manufacturer: Subject to compliance with requirements, polymer coating that may be incorporated into the Work include, but are not limited to, the following:

a) Merchants Metals Brighton Colorcoat II fused and adhered polymer coating.

5. Selvage: Knuckled at both selvages.

2.2 FRAMEWORK MATERIALS

A. Posts and Rails: Comply with ASTM F 1043 for minimum dimensions and wall thickness of framing, including rails, braces, and line; terminal; and corner posts, meeting the following criteria:

1. Heavy Industrial Strength: ASTM F 1043 Group I-C, SS40, round steel electric-resistance-welded pipe galvanized with hot-dip process in accordance with ASTM A653/A653M and ASTM A924/A924M.

2. Manufactured to meet minimum yield strength of 50,000 psi and coated in accordance with the following standards:

    a. ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, heavy industrial weight.
    b. M181, Type I, Grade 2, Electrical Resistance Welded Steel Pipe
    c. RR-R 191/3, Class 1, Grade B, Electrical Resistance Welded Steel Pipe.

B. Coatings:

1. Zinc Coating:

    a. Zinc coating to conform to ASTM B6 and the weight range (external and internal) of ASTM F1043, Type B. Exterior surface of the weld to be recoated with the same material and thickness as the basic zinc coating.

    b. Weight of the zinc to be determined through ASTM A90, 1.8 w/ PVC, 2.0 oz w/o vinyl.

    c. Final coat to be a clear acrylic finish.

2. PVC / Polyester Coating Over Zinc Coating:

    a. Thermoplastic vinyl finish to be 10 mils (minimum) thick.

    b. Cleaning and Surface Preparation: Consists of a four-stage pretreatment/wash, an iron phosphate coating and immersion in a water based epoxy primer.

    c. PVC Coating Application: Coating is thermally fused to heated pipe meeting the following standards:

        1) ASTM F1043 Group I-C, Heavy Industrial.
        2) Federal specification RR-F-191/3E, Class 1
        3) Shows satisfactory adhesion in cross-hatch test, Method B, ASTM D3359.
        4) Finish shall not crack, blister or split under normal use.

3. Color: Match chain-link fabric, complying with ASTM F 934, Standard Colors for Polymer-Coated Chain Link Fence Materials.

C. Basis of Design Manufacturer: Subject to compliance with requirements, framework and coatings that may be incorporated into the Work include, but are not limited to, the following:

1. Merchants Metals Colorbond Chain Link Fence Framework and Coating System.
2. Master Halco Permafused II Heavy Mil PVC Chain Link Fence Framework and Coating System.
3. Ameristar PermaCoat PC-40 (industrial weight), manufactured by Ameristar Fence Products (www.ameristarfence.com) Chain Link Fence Framework and Coating System.

2.3 FRAMEWORK SIZES

A. Line Post Size (determined by height):

1. 4 feet up to and including 6 feet high: 2 inches o.d.

B. End, Corner and Pull Post:

1. 4 feet up to and including 6 feet high: 2-1/2 inches o.d.

C. Horizontal Framework Members: Intermediate, top and bottom rails complying with ASTM F 1043. Size in accordance with the following guidelines unless otherwise indicated on drawings:

1. Top, Intermediate and Bottom Rail: 1.66 inches in diameter.

a. Bottom Rail: Provide bottom rail for:

1) Fence 6 feet high and over, or as shown on drawings.

b. Intermediate Rail: Provide intermediate rail for:

1) Fencing 6 feet high and over, or as shown on drawings.

2. Brace Rails: Comply with ASTM F 1043.

2.4 FITTINGS

A. General: Comply with ASTM F 626.

B. Post Caps: Provide for each post. Post caps to be weather-tight, securely fastened and vandal-resistant.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel. Length not less than 2 inches shorter than full height of chain-link fabric with minimum cross-section of 3/16 inch x 3/4 inch. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading. Provide rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:

a. General Use Fencing:

1) Aluminum: ASTM B 211; Alloy 1350-H19; 0.148-inch-diameter, mill-finished wire. Coating to match chain-link fence fabric. (Provide coating to match framework.)

I. Fitting Finish:

1. Steel or cast iron: Galvanized Coating for Pressed Steel or Cast Iron - Not less than 1.2 oz. /sq. ft. zinc.

a. Coating - Vinyl-coated per ASTM F 626. Coating to match framework.

2. Aluminum: Mill finish with coating to match framework.

3. Color: To match color of fence fabric.

J. Fasteners:

1. Material to be stainless steel.

a. Coating - Vinyl-coated per ASTM F 626. Coating to match framework.

2. Color: To match color of fence fabric.

3. Finish: Install fasteners that are no more than ¼ Inch long.

2.5 SWING GATES

A. General: Comply with ASTM F 900 for gate posts and single and double swing gate types.

1. Gate Leaf Width: 48 inches unless otherwise noted on drawings.
2. Gate Fabric Height: As indicated on drawings.

B. Pipe and Tubing:

1. Coating and finish to match fence framing.

2. Gate Post Size:

a. For gate heights over 6', and if gate height is equal to fence height, then standard fence framing end post requirements shall apply. Refer to Post and Rail requirements.

b. Gate Leaf up to 6 feet Wide: 2.875 inches o.d.; 4.64 lbs./l.f.

c. Gate Leaf over 6 feet and under 12 feet wide: 4 inches o.d.; 6.56 lbs./lin. ft. (weight applicable to Group IC SS40 framework only)

C. Frame Corner Construction: Welded.

D. Swing Gate Hardware:

1. Hinges: 180-degree inward swing unless otherwise noted on Drawings.

2. Latches: Commercial latch permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.

3. Padlock and Chain: Owner furnished.

4. Keeper: Provide keeper for all vehicular gates, which automatically engages gate leaf and holds it in open position until manually released. Provide sleeve to insert keeper. For concrete paving, set sleeve directly into concrete. For asphalt paving set sleeve into concrete collar.

5. Double Gates: Provide drop bar for all double gates, consisting of hot-dipped galvanized rod that drops into concrete collar. Provide locking device and padlock eyes as an integral part of the latch, requiring one padlock for locking both gate leaves.

6. Closer: Manufacturer's standard.

7. Color: To match fence fabric.

2.6 PRIVACY SLATS – 90 Percent Coverage

A. Material: Heavy duty polyethylene reinforced tubular slats with “wings”:

1. Provide 90% coverage.
2. Slats must span full height of fence (i.e., no partial height slats).
3. Slat Width: 1 7/16” for 2” Mesh Size.
4. Manufactured for chain-link fences from virgin polyethylene containing UV inhibitor.
5. Sized to fit mesh specified with vandal-resistant fasteners and lock strips.
6. Installed vertically.
7. Verify wind-loading is appropriate for fencing specified and application.

B. Color: As selected by Architect from manufacturer's full range.

2.7 CONCRETE

A. Concrete Footings: Refer to Division 03 concrete section for cast-in-place concrete, ASTM F 567 Section 5 and Drawings and Details for footing size. Bottom of footing must not be smaller than the top to prevent frost heaving.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.

1. Install fencing on established boundary lines inside property line.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil. Mechanically driven posts only allowed if shown on Drawings or specifically approved by Architect.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

a. Concrete Fill: Minimum 28-day compressive strength 3,000 psi (20 MPa). Refer to Division 03 Section "Cast-in-Place Concrete."
b. Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

C. Types of Post Footings: As indicated on Drawing or as approved by Architect.

1. Concealed Concrete: As indicated on Drawings to allow covering with surface material.

D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

E. Line Posts:

1. General Use Fencing: Space line posts uniformly at 10 feet o.c. unless otherwise indicated on Drawings.

F. Post Bracing, Bottom and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps / loop caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps / loop caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer. Connection sleeves to be located / supported by post caps / loop caps.

H. Intermediate and Bottom Rails: Install and secure to posts with fittings.

I. Chain-Link Fabric: Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

1. Height of fabric between finished grade and bottom selvage.

a. General Use: Leave 1 ½ inches between finished grade or surface and bottom of selvage unless otherwise indicated.

2. Fabric installation on fence posts relative to adjacent use:

a. General Use: Apply fabric to outside of enclosing fence posts / framework as indicated on Drawings.

J. Tension or Stretcher Bars: Thread bar through first row of diamonds of fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Aluminum ties: Both ends of the tie are to make two complete wraps around wire pickets. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 18 inches o.c.
2. Privacy Slats: Install slats in direction indicated, securely locked in place, vertically.

3.5 SWING GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain chain-link fences and gates.

3.8 COMPLETION AND CLEAN UP

A. Leave the area of installation free of debris and excess soil, concrete, and gravel resulting from installation of the fence. Clean fencing of concrete slurry, hydroseeding overspray and any other excess material. Seed and mulch all areas around the fencing where bare earth is left exposed.

END OF SECTION 32 31 13

SECTION 32 50 00 - BOLLARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pre-fabricated bollards.
2. Bollard covers.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Pre-fabricated bollards.
2. Bollard covers.

B. Shop Drawings: Show fabrication and installation details for bollards.

1. Include plans, elevations, sections, and details of bollards and their connections. Show anchorage and accessory items.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pre-Fabricated Metals Bollards Warranty: Provide manufacturer's standard limited warranty that the bollards will remain free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of three years from date of purchase.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of construction contiguous with bollards by field measurements.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages. 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. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 Type 316 stainless-steel fasteners. Select fasteners for type, grade, and class required.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Acrylic Primer: Thermoplastic acrylic primer compatible with topcoat.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Rust-Oleum Corporation; 3200 System Clear Blue Undercoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3,000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items 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. Form exposed work with accurate angles and surfaces and straight edges.

E. 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. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. 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.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 BOLLARD COVERS

A. Plastic Bollard Cover: Heavy duty plastic bollard cover that fits over standard site-fabricated steel bollard.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Ideal Shield, Plastic Bollard Cover, ¼" thick polyethylene or comparable product.
2. Materials: 1/4" thick UV resistant and anti-static LDPE plastic sleeve, domed at top
3. Sleeve for pipe diameter: 6 inch.
4. Color: Architect to choose from full range of standard colors. Color warrantied for five years.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Coordinate location to avoid utilities.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

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. 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.

F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING FABRICATED METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards in place with concrete footings. Center and align bollards in holes 12 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured. Set bollard plumb.

3.3 INSTALLING PLASTIC BOLLARD COVERS

A. Install with manufacturer's neoprene adhesive tape per manufacturer's installation guidelines.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Provide touchup painting in conformance with Section 09 96 00, "High Performance Coatings".
B. Clean all surfaces thoroughly and protect until acceptance.

END OF SECTION 32 50 00

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Sodding
3. Turf planting soil.
4. Turf planting soil amendments and fertilizers.
5. Turf renovation.
6. Turf
7. Turf maintenance.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including:

1. Seed.
2. Sod.
3. Fertilizer.
4. Imported Topsoil.

B. Samples for Verification: For the following products, in sizes or quantities indicated below:

1. Imported and On-Site Topsoil: One-half gallon by volume of material in sturdy container of each type of topsoil, naming source for each material.

C. Warranty: Sample of special warranty.

1.5 INFORMATIONAL SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

B. Qualification Data: For qualified landscape Installer.

C. Product Certificates: For soil amendments and fertilizers, from manufacturer.

D. Material Test Reports:

1. Imported Topsoil: Before delivery, submit written statement giving location of properties from which topsoil is to be obtained, names and addresses of property owners, analysis of topsoil, depth to be stripped, and any crops grown during the previous 5 years.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

B. Warranty: Executed special warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Turf Installer: Engage an experienced turf installation firm to perform work of this Section that has installed at least seven (7) acceptable projects of the type specified within past 5 years. Provide location and reference contacts for each of the submitted projects.

2. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.

3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor with certifications outlined below on Project site when work is in progress.

4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:

    a. Certified Turfgrass Professional, designated CTP.
    b. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university 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. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; available nutrients; deleterious material; pH and recommendations to obtain optimal pH factor; mineral and plant-nutrient content of the soil; map with locations where each sample was collected; date, time and weather when samples were collected; and name of person who collected the samples.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.

2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.

3. Report suitability of tested soil for turf growth.

    a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1,000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.

    b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.9 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

1. Spring Planting: March 15 to May 15.
2. Fall Planting: August 15 to September 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.10 SEQUENCING AND REVIEW

A. Notify Architect no fewer than 48 hours in advance of proposed seeding and sodding to allow review of topsoil finish grading.

B. Do not proceed with seeding and sodding without Architect's written permission.

1. Architect’s written permission does not alleviate Contractor from conforming to the required grades indicated on Drawings.

1.11 MAINTENANCE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, as determined by the Architect, but for not less than the following periods:

1. Seeded and Sodded Turf: Five (5) documented mowings.

a. Document mowings in writing via fax or email to Owner and Architect on the day each mowing is performed. Failure of notification may subject Contractor to further mowings at no additional cost to Owner.

2. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

B. Water: Provide all water required to properly irrigate temporary, permanent, and renovated turf areas. Include all facilities including, but not limited to, hoses, sprinklers, water cannons and reels, as long as it takes to establish and maintain turf. When adequate water supply or pressure is not available, supply water from offsite, including trucking.

1.12 WARRANTY

A. Special Warranty: Installer agrees to repair or replace turf that fails in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.

2. Warranty Period:

a. Turf: 12 months, after acceptable turf is established, as determined by the Architect.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead turf and replace unless required to plant in the succeeding planting season.
b. Replace with seed or sod as originally specified.

B. Provide extended warranty for period equal to original warranty period, for replaced turf material.

PART 2 - PRODUCTS

2.1 SEED

A. Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Blends: Seed blend with not less than 95 percent germination, not less than 85 percent live seed, and not more than 0.5 percent weed seed.

1. If premixed blend, follow manufacturer’s recommended maximum seeding rate unless otherwise noted.

C. Lawn Seed:

1. Varieties: Premier varieties of Kentucky bluegrass, perennial ryegrass, tall fescue and fine fescue with a mean ranking of 6.0 or higher on the National Turfgrass Evaluation Program (NTEP) current list of tested varieties for the Northeast United States.

D. Seed Blends: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

1. General Lawn Sun/Shade Mixture: Proportioned by weight as follows:

a. 75 percent, 1/3 equal mixture of three Kentucky bluegrass (Poa pratensis) varieties.
b. 25 percent fine fescue (Fescue rubra).

2.2 TURFGRASS SOD

A. Turfgrass Sod: Gold Tag certified premium quality seed, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Varieties: Premier varieties of Kentucky bluegrass and fescue with a mean ranking of 6.0 or higher on the National Turfgrass Evaluation Program (NTEP) current list of tested varieties for the Northeast United States.

C. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

1. Full Sun: Kentucky bluegrass (Poa pratensis), a minimum of three varieties.
2. Sun and Partial Shade: Kentucky bluegrass (Poa pratensis) and fescue blend.

D. Moisture Content: Do not harvest or transplant sod when moisture content (excessively dry or wet) may adversely affect its survival.

E. Height: Mow sod before stripping to a height of one inch to 2-1/2 inches.

F. Thickness of Cut: Machine cut sod at a uniform soil thickness of 5/8-inch, plus or minus 1/4-inch, at time of cutting. Exclude top growth and thatch from measurement for thickness.

G. Pad Size: Cut to supplier’s standard width and length. Maximum allowable deviation from standard widths of 1/2-inch. Maximum allowable deviation from standard length of 5 percent. Broken pads and torn or uneven ends not acceptable.

H. “Big Roll” Form: Sod cut a minimum 42 inches wide and 100 feet long, machine cut at uniform soil thickness of 0.75-inch, measured to exclude top growth and thatch.

I. Strength of Sod Sections: Standard size sections of strong strong enough to support own weight and retain size and shape when suspended vertically from a firm grasp on the upper 10 percent of the section.

J. Thatch: Up to 1/2 inch height (uncompressed) allowable.

K. 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. CY Farms/Batavia Turf.
2. Lakeside Sod Supply Co., Inc.

2.3 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. 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, unless otherwise indicated:

1. Spring Fertilization: 10 percent nitrogen, 6 percent available phosphorous, and 4 percent water-soluble potash (10-6-4).

2. Fall Fertilization: 5 percent nitrogen, 10 percent available phosphorous, and 5 percent water-soluble potash (5-10-5).

3. Final Fertilization:

a. Spring: Granular slow release fertilizer with high nitrogen (38 percent), Uramite or other Architect-approved material.
b. Fall: “Fall Fertilization” composition above.

4. Follow requirements regarding fertilization recommended in soil reports from a qualified soil-testing laboratory.

2.4 TURF PLANTING SOILS

A. General: Provide turf planting soil consisting of existing and/or imported topsoil with amendments and fertilizers noted in this Section. Unamended existing or imported topsoil is not acceptable as turf planting soil.

1. Where quantities of existing topsoil are insufficient to provide 6 inch depth turf planting soil, supplement with imported topsoil, at no additional cost to Owner.

B. Topsoil Requirements: Free of subsoil, stones 1 inch or larger in any dimension, dense material, hardpan, slag, clay, cinders, sod, roots, sticks, poison ivy, crabgrass, cough grass, noxious weeds, and foreign matter, including but not limited to glass, screws, asbestos, toxins, hazardous wastes, petroleum product contamination, lead and chemicals (such as atrizene and muriatic acid) that may be injurious to humans, animals and plant materials.

1. Topsoil to comply with the following:

a. Organic Matter Content: Not more than 10 percent.
b. Corrected to pH Value: 6.5 to 7.5 on that portion passing 1/4-inch sieve.
c. Soluble Salt Content: Not to exceed 500 parts per million.

C. Existing Topsoil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil.

1. Provide soil analysis per requirements in Part 1 of this Section.

D. Imported Topsoil: Imported topsoil obtained from local sources or from areas having similar soil characteristics as Project site. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 6 inches deep; do not obtain from agricultural land, bogs or marshes.

1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

2. Provide soil analysis per requirements in Part 1 of this Section.

E. Required Amendments: Mix existing and imported topsoil with the following soil amendments in the following quantities to produce planting soil:

1. pH Adjustment: Apply approved calcium or sulfur compounds to correct pH level to be between 6.5 and 7.5 or as recommended by soil analysis report.
2. Soil Analysis Recommendations: Provide nutritional and other amendments recommended in the soil analysis report, as approved by Architect.
3. Provide fertilizer per “Fertilizer” Article above.

2.5 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.6 EROSION-CONTROL MATERIALS

A. Refer to Section 31 25 00 “Erosion and Sedimentation Controls.”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Spread planting soil to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

   a. Spread approximately 1/3 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
   b. Reduce elevation of planting soil to allow for soil thickness of sod.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's written permission; restore planting areas if topsoil finish grading is eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Timing: Provide seeding within planting times indicated.

   1. Seed at earliest possible date to achieve mature turf prior to Owner occupancy.

B. Sow seed with Brillion spreader or similar seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in three passes: second pass at 90 degrees to the first, third pass at 45 degrees to second.

   1. Do not use wet seed or seed that is moldy or otherwise damaged.
   2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

C. Sow seed at a total rate of 6 lb/1,000 sq. ft.

D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

E. Protect seeded areas with slopes not exceeding 1:4 as follows:

1. In small areas adjacent to buildings, at parking islands and narrow strips of seeding along paving, spread straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment. Avoid areas of thick mulch that will prevent seed determination.

2. In larger areas, including athletic fields if approved by Architect, mulch by hydromulching.

F. Water newly planted areas and keep moist until new turf is established.

3.5 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across angle of slopes exceeding 1:3.

2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

D. Water newly sodded areas and keep moist until new turf is established.

3.6 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Use hand weeding to control weeds. Schedule weedings throughout the year to maintain turf as free of weeds as possible.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf when new growth reaches 3.75-4.5 inches in height. Repeat mowing to maintain specified height once per week or as needed to ensure the maximum height does not exceed 4.5 inches between mowing. 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 turf to a height of 2-1/2 to 3 inches.
2. Neatly trim edges and hand clip where necessary.
3. Immediately after each mowing (same day), carefully remove excess clippings to prevent damage to turf.

D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.

3.7 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: 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. and bare spots not exceeding 5 by 5 inches.

2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, brown spots, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

C. Warranty period does not begin until satisfactory turf is established, as determined by the Architect.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 32 92 00

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Non-pressure transition couplings.
3. Drains.
4. Frames and grates/lids
5. Catch basins.
6. Stormwater Manholes.

B. Related Sections:

1. Section 01 78 39 “Project Record Documents”
2. Section 31 20 00 "Earth Moving"

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Stormwater Manholes: Include plans, elevations, sections, details, frames, covers, and grates.
2. Catch Basins. Include plans, elevations, sections, details, frames, covers, and grates.

C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

D. Quality Control Submittals

1. Qualifications Certification: Submit written certification or similar documentation signed by applicable subcontractor, Prime Contractor and manufacturer (where applicable) indicating compliance with applicable “Qualifications” requirements specified below in “Quality Assurance” article.

2. Installer Experience Listing: Submit list of completed projects using products proposed for this Project, including owner's contact and telephone number for each project, demonstrating compliance with applicable "Qualifications" requirements specified below in "Quality Assurance" article.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Perform work, including shoring, in compliance with the applicable requirements of governing authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
B. Protect pipe, pipe fittings, and seals from dirt and damage.
C. Handle stormwater manholes according to manufacturer's written rigging instructions.
D. Handle catch basins/storm inlets according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 SOLID DOUBLE WALL HDPE SMOOTH INTERIOR PIPE:

A. Interior Diameter, 4" to 36": Corrugated polyethylene circular pipe with an integrally formed smooth interior complying with the following specifications:

1. Applicable Standards:

a. 4 inch to 10 inch pipe: AASHTO M 252-Type S or SP
b. 12 inch to 36 inch pipe: AASHTO M294-Type S or SP

2. Mannings "n" Value: 0.012.

3. ASTM D3034 for maximum allowable deflection.

4. Fittings: Meet performance requirements of ASTM D 3034 and ASTM F 1336. Gaskets to comply with ASTM F477.

5. Manufacturer: Similar to "N-12 Smooth Interior Pipe" by Advanced Drainage Systems, Inc.; London, Ohio.

B. Interior Diameter, 4" to 30": Corrugated polyethylene circular pipe with silt-tight joints and an integrally formed smooth interior complying with the following specifications:

1. Applicable Standards

a. 4 inch to 10 inch pipe: AASHTO M 252-Type S or SP
b. 12 inch to 36 inch pipe: AASHTO M 294-Type S or SP

2. Mannings "n" Value: 0.010.

3. Fitttings: AASHTO M252 or M294.

4. Joints: Meeting AASHTO Standard Specification for Highway Bridges, Section 26 paragraph 26.4.2.4(e). Silt tight – meeting ASTM D1056 Grade 2A2.

5. Materials: ASTM 3350 minimum cell classification 324420C (4" to 10") or 335420C (12" to 30").

6. Similar to "Hi-Q Pipe" by Hancor, Inc.; Findlay, Ohio.

2.2 PERFORATED SINGLE WALL HDPE CORRUGATED PIPE:

A. Interior Diameter, 3" to 24": Corrugated perforated single wall polyethylene circular pipe with uniform slots and drilled holes complying with the following specifications:

1. Applicable Standards:

a. 3 inch to 10 inch pipe: AASHTO M 252
b. 12 inch to 24 inch pipe: AASHTO M294

2. Fittings: Meet performance requirements of ASTM D 3034 and ASTM F 1336. Gaskets to comply with ASTM F477.

3. Manufacturer: Similar to "Perforated Single Wall Plastic Corrugated Pipe" by Advanced Drainage Systems, Inc.; London, Ohio.

2.3 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4,000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3,000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.4 CATCH BASINS

A. Inside Dimension: 30-inch by 30 inch clear inside area, unless otherwise indicated.

B. Description: ASTM C 913, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

C. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

D. Riser Sections: 4-inch minimum thickness, Length, Width and Depth as indicated.

E. Top Section: Flat-slab-top type is indicated.

F. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

G. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.

H. Grade Rings: Include two or three reinforced-concrete rings, of 6 to 9-inch total thickness, that match the frame and grate, and height as required to adjust manhole frame and cover to indicated elevation and slope.

I. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

2.5 CATCH BASIN FRAMES AND GRATES

A. Heavy Duty Ductile Iron Frame and Grate:

1. Description: Heavy-duty 24-in by 24-in (nominal clear opening) ductile iron frame and grate.

2. Material Requirements:

   a. Material: ASTM A 536, Grade 70-50-05, ductile iron designed for A-16, structural loading. Meets AASHTO M306
   b. Grate style: Bar, Flat
   c. Frame style: Top Flange, Reversible, Bottom Flange
   d. Coating: Asphaltic Coated
   e. Color: Black
   f. Origin of manufacture: USA
   g. Clear opening depth: 24-in minimum, unless otherwise indicated
   h. Clear opening length: 24-in minimum, unless otherwise indicated
   i. Cover/Grate opening depth: 2-in
   j. Cover/Grate opening width: 26-in
   k. Cover/Grate opening length: 26in
   l. Flange inner length: 26-in
   m. Flange inner width: 26-in
   n. Flange outer length: 32-in
   o. Flange outer width: 32-in
   p. Frame height: 6-in
   q. Frame outside length: 27.5-in
   r. Frame outside width: 27.5-in
   s. Grate thickness: 2-in
   t. Grate length: 25.75-in
   u. Grate width: 27.75-in
   v. Grate open area: 321 sq. in.
   w. Grate wetted perimeter: 103-in
   x. Slot width: 1.5-in
   y. Tag Text: “Drains To Waterways Dump No Waste!”

3. Basis-of-Design Product: Subject to compliance with requirements, provide EJ Group Inc., Product No. 45726033C03 – “Classic Series V5626-2 REV 6” V5726 EXHD DI GR SET” by EJ Group Inc. (East Jordan Iron Works), 301 Spring Street, East Jordan, MI 49727 Telephone: 1-800-874-4100.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24-in by 24-in minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7 to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.6 STORMWATER MANHOLE

A. Standard Precast Concrete Stormwater Manholes:

1. Diameter: 48 inches minimum unless otherwise indicated.

2. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

4. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.

5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

7. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.

8. Grade Rings: Include two or three reinforced-concrete rings, of 6 to 9-inch total thickness, that match 24-inch diameter frame and grate, and height as required to adjust manhole frame and cover to indicated elevation and slope.

9. Steps: Individual FRP steps or FRP ladder, Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.

10. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.

11. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

2.7 STORMWATER MANHOLES– FRAMES AND GRATES / COVERS

A. Frames and Grates (Open Grates):

1. Description: Castings of uniform quality, free from blow holes, porosity, hard spots, shrinkage defects, cracks, or other injurious defects. Manufactured true to pattern and free from surface imperfections. Provide machined horizontal bearing surfaces on heavy duty round frames and grates and fabricate round frames and grates in pavement of non-rocking design or with machined bearing surfaces. Grinds finish other units to proper fit.

2. Frame and Grate

    a. Material: Class 35B Cast Iron
    b. Loading Requirements: AASHTO M306 (Meets or Exceeds H20 Loading)
    c. Coating: Shop Dipped Black Asphaltum.

3. Frame:

    a. Frame Depth: 7-inches
    b. Clear open width: 24 inches
    c. Overall frame width: 36 inches diameter

4. Grate – Non-ADA Flat Grate:

    a. 26 inch open diameter
    b. Grate Open Area: 190 square inches
    c. Lettering: “Dump No Waste”

5. Grate – ADA Flat Grate:

    a. 26 inch open diameter
    b. Grate Open Area: 130 square inches
    c. Lettering: “Dump No Waste”

6. Basis of Design: Similar to Frame “Model #1045 (#00104510) and Grate “Type M3 ADA Grate” (#00104036) by East Jordan Iron Works, Inc.

7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Neenah Foundry Co.
    b. East Jordan Iron Works, Inc (EJ Group, Inc.)
    c. Campbell Foundry
    d. General Foundries

2.8 IDENTIFICATION

A. Underground Warning Tape

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Presco, Inc.; Sherman, Texas
   b. EMED Co., Buffalo, New York.
   c. Seton Identification Products, A Tricor Direct Company.

2. Material: 6-inch wide, color-coded, heavy gauge 5-mil tape with aluminum backing.

3. All tapes printed with black ink on APWA (American Public Works Association) approved colors to meet or exceed industry standards.

4. Location: Provide warning tape 18 inches feet below finished grade in buried piping trenches and at foundation wall.

2.9 CONCRETE

A. Cast-in-Place Concrete: Refer to Div 03 concrete section for concrete strength, mixtures, fiber reinforcement and other requirements.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

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 into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.

2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.

3. Install piping with 36-inch minimum cover.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
2. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
3. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
4. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
5. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
6. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.
B. Install precast concrete manhole sections with sealants according to ASTM C 891.
C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements.

3.5 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.
B. Set frames and grates to elevations indicated.

3.6 CONCRETE PLACEMENT

A. Place and test cast-in-place concrete according to ACI 318 and Division 03 concrete section**.**

3.7 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3,000 psi.

2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3,000 psi.

3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3,000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.8 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate 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. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

4. Submit separate report for each test.

5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
b. Option: Test plastic piping according to ASTM F 1417.
c. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 33 41 00

SECTION 34 71 13.26 – VEHICLE GUIDE RAILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. New box-beam guiderails, posts and component parts where indicated on Drawings.

B. Related Sections:

1. SECTION 31 10 00 - Site Clearing
2. SECTION 31 20 00 - Earth Moving
3. SECTION 32 12 16 - Asphalt Pavement
4. SECTION 03 30 00 - Cast-in-Place Concrete

1.3 SYSTEM DESCRIPTION

A. Design Requirements

1. Box-beam Guidedrails: Comply with applicable requirements of New York State Department of Transportation (NYSDOT) "Standard Specifications" (January 2, 1981) including following:

a. Section 606 "Guide Railing"
b. Section 710-21 "Box Beam Guide Railing and Median Barrier"

1.4 SUBMITTALS

A. Comply with requirements of SECTION 01 33 00 - Submittals and as modified below.

B. Product Data: Submit manufacturer's product data indicating compliance with standards referenced herein.

C. Shop Drawings: Submit shop drawings indicating layout of guardrail installation, dimensions of guardrail section, and details of installation showing mounting heights, depth of post below grade and other details.

D. Contract Closeout Submittals: Submit maintenance and cleaning instructions as item in "General Construction Instructions" manual described in SECTION 01 77 00.

PART 2 - PRODUCTS

2.1 BOX BEAM GUIDERAILS

A. Components

1. Rails: Cold-formed, welded and seamless structural tubing of sizes and dimensions indicated on drawings and conforming to ASTM A500, Grade B as modified in Section 710-21 NYSDOT "Standard Specifications". Provide galvanizing complying with requirements of Section 719-01, Type I, NYSDOT "Standard Specifications."

    a. Connection Holes and Splicing Holes: Factory fabricated and re-galvanized in accordance with Section 710-21, NYSDOT "Standard Specifications". Splices lapped in direction of traffic.

2. Posts: American Standard Beam Section of sizes and dimensions indicated on drawings. Posts, splice tongues, plates and all hardware fabricated and ready for assembly before galvanizing.

    a. Posts, Splice Tongues, and Plates: Conform to ASTM A36 and galvanized in accordance with Section 719-01, Type I, NYSDOT "Standard Specification".
    b. Hardware: Galvanized in accordance with Section 719-01, Type II, NYSDOT "Standard Specifications".

3. Fasteners

    a. Bolts and Nuts: Conform to ANSI B 18.2.1 and ANSI B 18.2.2.
    b. Washers: Conform to ANSI B 18.22.1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Erect posts, railing, end assemblies and rail transitions in positions and manner indicated on drawings. Comply with requirements of Section 606-3, NYSDOT "Standard Specifications".
B. Posts: Driven in accordance with Section 606-3, NYSDOT "Standard Specifications" and aligned to tolerance of 1/4" for plumb and grade line.
C. Rail Splices: Not less than 18 ft. on center; minimum 18" from centerline of any post.

3.2 CLEANING

A. Upon completion of installation, remove all debris and surplus material. Restore surrounding grass areas and site improvements damaged or soiled as a result of this guide rail installation.

END OF SECTION 34 71 13.26